

# Bachelor/Master Thesis Topic

## Automatic Fault Localization using fine granular Influence Propagation

### Motivation and Background

Debugging a program in general and localizing faults, specifically, is one of the most time consuming task that developers have to do. Localizing a bug manually can be very tedious and may take a very long time. This is why it is sensible to find solid methods to aid developers with fault localization (FL) to speed up this process. In the past years, a variety of approaches for automatic FL have been proposed, but all of them still struggle from low accuracy and reliability. A recent approach employs the PageRank algorithm to better incorporate fault related influences using method call graphs [1]. The main idea is: If a suspicious method calls other methods or if a method is called by suspicious methods, its suspiciousness increases. While the technique improves FL capabilities, it is tied to the method level. This may be too coarse to identify the bug in a lot of cases, and the technique is also unable to use any more finer grained control flow information.

### Goals

The student is to implement and evaluate the technique in the paper in its proposed form, using an existing framework. The main goal of the thesis is to apply the technique to a finer granularity level that is based on execution traces.

### Description of the Task

The student needs to find/develop an algorithm to generate a call graph between finer grained elements that are extracted from the execution traces. In the end, the original and the altered technique are to be evaluated on an existing benchmark. A detailed description of the task will be given personally on interest.

### Research Type

Theoretical Aspects: \*\*\*\*\*

Industrial Relevance: \*\*\*\*\*

Implementation: \*\*\*\*\*

### Prerequisite

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

### Skills required

Programming skills in Java, understanding of, or willingness to learn, the architectural and statistical foundations needed for the project.

### References

[1] H. He, J. Ren, G. Zhao and H. He, "Enhancing Spectrum-Based Fault Localization Using Fault Influence Propagation," in IEEE Access, vol. 8, pp. 18497-18513, 2020.

### Contacts

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### Application

Please contact during office hours or write an email with the title: "AFL-IP" to [se-career@informatik.hu-berlin.de](mailto:se-career@informatik.hu-berlin.de)