Bachelor/Master Thesis Topic

Metamorphic Testing in Computational Materials Science Data Analysis Workflows

Motivation and Background
Software testing is a crucial part of software development. It enables assurance, of correctness, completeness, and reliability of software systems. Current state-of-the-art software testing techniques employ techniques like metamorphic testing [1], which is specifically designed to test software without an oracle. The idea is to identify and refine a set of metamorphic relations between the software inputs and outputs. Just to give an abstract example, for a square root function $\sqrt{x}$ the relation $x=\sqrt{x}\times\sqrt{x}$ should hold under reasonable floating point accuracies. Identifying such relations is highly domain dependant and in the field of Computational Materials Science (CMS) in particular, it is still an open research question [2].

Goals
The goal of this project is to identify, understand, and explain metamorphic relations in the field of CMS.

Description of the Task
- Getting familiar with the automated techniques to identify metamorphic relations
- Implement tool to identify such relations in CMS DAWs
- Perform an experimental evaluation of these hidden metamorphic relation

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 or C++, understanding of, or willingness to learn, the software engineering and software analysis foundations needed for the project.

References

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Application
Please contact me during my office hours or send me an email with the title: “[ThesisProject]-MetamorphicTestingInCMSDAWs” to se-career@informatik.hu-berlin.de