**FACULTY OF INFORMATION TECHNOLOGY CTU IN PRAGUE**

# Supervisor's statement of a final thesis

| | |
|---|---|
| **Supervisor:** | Pierre Donat-Bouillud, Ph.D. |
| **Student:** | Petr Šťastný |
| **Thesis title:** | Symbolic execution for R |
| **Branch / specialization:** | Computer Science |
| **Created on:** | 10 June 2024 |

## Evaluation criteria

### 1. Fulfillment of the assignment

- ▸ [1] **assignment fulfilled**
  [2] assignment fulfilled with minor objections
  [3] assignment fulfilled with major objections
  [4] assignment not fulfilled

All the goals of the assignment were fulfilled.

### 2. Main written part 100 / 100 (A)

Petr uses a lively style for the thesis, which makes the reading enjoyable. He guides the reader through his thought process and emphasizes well the challenges of doing symbolic execution for R.

### 3. Non-written part, attachments 99 / 100 (A)

The non-written was a lot of work and even the start was challenging, as replicating Chef on the article languages, Lua and Python, was difficult because of the old age of the tool. Petr had to do some archeology in 10 years old Docker image. He also managed to get an understanding of 2 large codebases of Klee, S2E, and R! Chef is now updated to the most recent version of S2E for example.
The application part is extensive, as it touches bug finding, type inference, large scale experiments (although I might have liked the experiments to be on an even larger scale).

### 4. Evaluation of results, publication outputs and awards 100 / 100 (A)

The thesis results in a usable symbolic execution for R, which can scale to relatively large programs. Its application to type inference is a promising area of research. We are planning to apply it to the R builtins.

It also provides an up-to-date Docker image which packages the various complex dependencies of the tool, which makes it easy to reuse.

### 5. Activity of the student

▸ [1] **excellent activity**
[2] very good activity
[3] average activity
[4] weaker, but still sufficient activity
[5] insufficient activity

It was a pleasure to work with Petr, who was very motivated and interested in the topic, and often responded with enthusiasm to my frequent suggestions.

### 6. Self-reliance of the student

▸ [1] **excellent self-reliance**
[2] very good self-reliance
[3] average self-reliance
[4] weaker, but still sufficient self-reliance
[5] insufficient self-reliance

Petr was able both to suggest new venues of ideas and implement them. He never got desperate when long-expired keys, old versions of Linux, unmaintained software, cryptic documentations, and broken links, were going in the way, or when nearly random segmentation fault appeared when modifying some struct layouts in the R codebase.

## The overall evaluation 100 /100 (A)

This thesis is an impressive work, both in the amount of effort dedicated to it and also in the technical and scientific achievements it resulted in. It provides the R community a usable tool to perform symbolical execution on R programs and validates the Chef approach to write symbolic execution for interpreted languages by symbolic executing the interpreter of the language.

# Instructions

## Fulfillment of the assignment

Assess whether the submitted FT defines the objectives sufficiently and in line with the assignment; whether the objectives are formulated correctly and fulfilled sufficiently. In the comment, specify the points of the assignment that have not been met, assess the severity, impact, and, if appropriate, also the cause of the deficiencies. If the assignment differs substantially from the standards for the FT or if the student has developed the FT beyond the assignment, describe the way it got reflected on the quality of the assignment's fulfilment and the way it affected your final evaluation.

## Main written part

Evaluate whether the extent of the FT is adequate to its content and scope: are all the parts of the FT contentful and necessary? Next, consider whether the submitted FT is actually correct – are there factual errors or inaccuracies?

Evaluate the logical structure of the FT, the thematic flow between chapters and whether the text is comprehensible to the reader. Assess whether the formal notations in the FT are used correctly. Assess the typographic and language aspects of the FT, follow the Dean's Directive No. 52/2021, Art. 3.

Evaluate whether the relevant sources are properly used, quoted and cited. Verify that all quotes are properly distinguished from the results achieved in the FT, thus, that the citation ethics has not been violated and that the citations are complete and in accordance with citation practices and standards. Finally, evaluate whether the software and other copyrighted works have been used in accordance with their license terms.

## Non-written part, attachments

Depending on the nature of the FT, comment on the non-written part of the thesis. For example: SW work – the overall quality of the program. Is the technology used (from the development to deployment) suitable and adequate? HW – functional sample. Evaluate the technology and tools used. Research and experimental work – repeatability of the experiment.

## Evaluation of results, publication outputs and awards

Depending on the nature of the thesis, estimate whether the thesis results could be deployed in practice; alternatively, evaluate whether the results of the FT extend the already published/known results or whether they bring in completely new findings.

## Activity of the student

From your experience with the course of the work on the thesis and its outcome, review the student's activity while working on the thesis, his/her punctuality when meeting the deadlines and whether he/she consulted you as he/she went along and also, whether he/she was well prepared for these consultations.

## Self-reliance of the student

From your experience with the course of the work on the thesis and its outcome, assess the student's ability to develop independent creative work.

## The overall evaluation

Summarize which of the aspects of the FT affected your grading process the most. The overall grade does not need to be an arithmetic mean (or other value) calculated from the evaluation in the previous criteria. Generally, a well-fulfilled assignment is assessed by grade A.