ROSE-HULMAN INSTITUTE OF TECHNOLOGY

Technik
Informatik & Medien
Hochschule Ulm
University of
Applied Sciences

Guideline on the Preparation of a Bachelor Thesis

Computer Science - International Program

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I. Preface

This guide is intended to help you answer all the relevant and recurring questions that arise in the context of the processing of a Bachelor thesis.

This document explains best practices and gives many indications, which are certainly generally valid. On the other hand, deviations depending on the nature of the work are not only possible, but certainly also meaningful. However, binding conditions are also addressed that are not negotiable.

Feedback, both in terms of missing aspects and ambiguous expressions, is always welcome. Over time, "Good Practices" are gathered, saving the following students tedious research.

II. Preparation

As you begin thinking about your Bachelor's thesis, you may naturally wonder what actually constitutes a Bachelor's thesis.

The Bachelor's thesis is a major report written after undertaking significant research in a subject area of interest to you. Its objective is to show that a student is able to deal independently with a topic from the chosen subject area within a limited timeframe using sound scientific methodology.

This objective encompasses three important criteria: timeliness, independence, and scientific knowledge.

Now, how do you find a topic for your Bachelor's thesis?

Possibilities are:

1. On request, the professors of the institution offer topics from their respective research environment / project environment / area of interest. Often, these topics can also be seen from the personal homepages or collected on the faculty side. If you are interested in one of these topics, please contact the appropriate professor.
2. You have an idea and want to be active in a specific area. Do not hesitate to contact a professor working in that area and formulate a concise topic.

In "Computer science – International Program" your advisor will be a professor from Rose-Hulman Institute of Technology (RHIT), where the co-advisor will be from Hochschule Ulm (HSU).

To be able to start with your work on your thesis at the beginning of your fourth year, you should start finding an appropriate topic and advisors in March of your third year of study.

To get an idea about topics other students worked on, you may participate via web conference at the yearly poster session in late March where this year's thesis students present their work. Through that event, students from HSU may become acquainted with advisors from Rose-Hulman and may learn about their major working areas.

Next step is to think of a topic that you would like to research. You should prepare a proposal (no more than two pages) for your thesis. This proposal should address the following issues:

- What is the topic you want to research?
- What is the initial situation and what is the problem?
- What is the relevance of the problem?
- Where do you expect to be at the end of your Bachelor's thesis?
- How do you intend to close the current gap?
- Are there already comparable solution approaches and where are they documented?

In addition, you should state faculty member(s) at Rose-Hulman and Hochschule Ulm you have discussed this research with and if any of them are willing to be your thesis advisors.

III. Enrollment

For enrollment, the student has to send via e-mail a proposal for his thesis to the department head of computer science at RHIT not later than April 15th.

The department faculty will review all proposals submitted and make recommendations as to which senior thesis proposals to commit to. The department will have decisions made by late April. If your thesis proposal is not accepted you should work with your potential advisor at Rose-Hulman to strengthen the proposal to get it to a quality where it will be accepted.

The student should use the remaining time of the semester to find a co-advisor at HS Ulm (if the student has not already done so).

IV. Supervision

Mainly, the supervision is accomplished by the advisor on-site. The co-advisor will be involved as needed.

In general, there should be a minimum of four appointments (usually via web conference) where both advisors and the student will discuss the current state of the thesis.

1. Meeting

Preferably before or at the latest at the beginning of the Bachelor's thesis, both advisors meet with the student. The goals of the Bachelor's thesis will be discussed and detailed. The goals will be categorized according to the categories:

- required
- should be achieved
- optional

It is the student's task to prepare this meeting.

The supervising professor ensures that the topic offers the potential for a bachelor's thesis and that all requirements of a bachelor's thesis can be covered. He ensures that in principle the work environment enables successful work.

2. Meeting

The second meeting usually takes place at the end of the fall term. The main goal is to ensure, that the thesis is on track. During induction, which takes place during the first term, new issues / unforeseen problems may appear. These issues may require an adjustment of the alignment of the whole thesis or of specializations.

From now on, there should be no major changes (also as a security for the student and the continuity of the work), in particular not any changes in the alignment etc. The "red thread" for the further work will be fixed from now on.

3. Meeting

This meeting takes place at the end of the winter term. At this point in time most research work should have been completed already. Major goal is to ensure a high quality report on the thesis topic.

4. Meeting

This meeting takes place at the end of the spring term. It is the final meeting where the students presents his thesis. The advisors will use this meeting to scrutinize unclear passages and details.

V. Outline of the written work

Some pieces of advice:

- The written document should be started early, during the fall quarter at Rose-Hulman.
- First, create a meaningful outline from which the "red thread" of your work becomes apparent. As a rule, it is advisable not to proceed rigidly from the front to the back when writing, but to begin with the analysis of the type of problem and the presentation of related work. If a section "Fundamentals" is necessary, it can usually be created very early, also. Typically, the sections "Introduction" or "Conclusion and Future Work" are candidates to be formulated only at the end in a satisfying form.
- During induction, it is strongly recommended to collect and comment on all used literature references. For example, use a tool like Zotero or Citavi in order to have direct access to the sources used. This enables correct citation.
- The correct citation is of fundamental importance for scientific work! Incorrect citing or the concealment of sources is not a trivial offense or mistake.
- The scope of the individual sections is not based on the time required for the respective work, but solely on the objective pursued. Typically, time-consuming preliminary work as well as excessive implementation work are only briefly presented, while justifications for favored solutions and the demarcation against the state of the art occupy a wide space.

In science, a basic outline usually looks similar to the following outline:

- Title page
- Declaration of Originality

  I hereby declare that this thesis is entirely the result of my own work except where otherwise indicated. I have only used the resources given in the list of references.

  Place, date and signature
- Abstract
- Acknowledgements

- Table of Contents
- 1. Introduction
- 2. Related Work
- 3. Method
- 4. Results
- 5. Conclusion and Future Work
- References

Sometimes an additional chapter "3. Fundamentals" is required. This is true in cases where very specific knowledge is required to understand the thesis.

This structure is not necessarily to be followed in detail, but rather in the sense of the word, with the coarse chapters usually being preserved. In particular, the choice of your own, subject-related chapter headings can be useful. The choice of a specific, subject-related heading is almost always appropriate for the chapter "Method". It is important to grasp the meaning of the individual sections and to use a suitable heading in the outline.

A good thesis is characterized by the fact that at any time the reader knows exactly where a contribution comes from and where the dividing line between facts and valuations runs. The clearer the justification for the approach, the clearer the interpretation of the results achieved, the clearer the scientific substantiation of the decisions, the better the written work will be.

VI. Grading

For grading, the following criteria will be considered holistically. Each work is evaluated individually, taking its character into account (for example, application-oriented, theory-related).

Insufficient performance in one of the following four categories can lead to not passed!

Example:

A good solution paired with an unusable written work may lead to not passed for the thesis.

- Work
    - comprehension, overview taking into account the difficulty level
        - broadness and profoundness of the subject covered
            - very good weighting
            - good weighting
            - not ideal
            - unilateral
            - wrong weighting
        - scope and content
            - very rich
            - rich

                - average
                - little substance
                - very little substance
            - analysis and evaluation of literature
                - comprehensive
                - the point
                - acceptable despite the incompleteness
                - defective
    - personal commitment, ingenuity, ideas, initiative, endurance, diligence
    - independence, personal scientific contribution

- Results
    - Achievement of objectives taking requirements into account
        - More than expected
        - Complete
        - With gaps in secondary objectives
        - Main objectives achieved, partly with gaps
        - No main goal fully achieved
    - implementation, function, scientific investigations
    - innovative content (scientific innovation, creativity, new points of view)
        - very high innovative content
            - creativity, new points of view
        - high innovative content
            - autonomous assignment of method to problem
        - few innovative content
            - obvious consideration / solution, neat diligence work
        - no innovative content
            - Reproduction and obvious solution

- Written elaboration
    - Clear outline and structure, completeness, accuracy of presentation
      *As long as necessary, as short as possibl*e!
    - Evaluation of results
        - Exact and boundaries sharply named
        - normal with open points
        - inexact and open issues
        - unusable

      An important part of your work is the presentation of the results obtained as well as their classification. If you represent, classify and evaluate your results accurately and with sharply defined limits, this results in a *very good* grading in this category. A *good* grading is appropriate when there is a normal representation with

open points. Typically, an inexact presentation with open questions leads to a satisfactory or sufficient impression. An unusable presentation of the results in this category is not sufficient.
    - Outer form, style, expression, error-freeness, spelling, citation

- Oral Presentation
    - There are four oral presentations associated with the Bachelor's thesis
        - Progress report at the end of the fall quarter
        - Progress report at the end of the winter quarter
        - Poster session early in the spring quarter
        - Final presentation at the end of the spring quarter
    - Each presentation will be graded on the following factors:
        - Quality of result illustration
        - Overall organization of the presentation
        - Behavior in academic discussion