A Bachelor’s or Master’s Thesis (same as an interdisciplinary project (IDP), guided research project (GRP), etc.) is a small-scale research project. This project needs to be performed by a student independently, but under the guidance of a staff member of the Chair. In order to finish it successfully, several individual tasks need to be completed by the student and some best practices obeyed.

Wording:

Student refers to the person that does her or his Master’s Thesis, Bachelor’s Thesis, IDP, GRP, etc.

Supervisor (“Aufgabensteller”) is an authorized examiner according to the responsible examination office; in case of our Chair this usually is Professor Carle who has the right to examine from the computer science and from the electrical engineering faculty.

Advisor (“Betreuer”) is a staff member of the Chair and an expert in the research area of the thesis. She gives feedback to the student and is the first contact person for all questions related to the research project.

Examination office (“Prüfungsamt”) is in charge of all formal tasks related to the student’s thesis. The regarding guidelines which reflect the corresponding study guidelines have to be paid with extra attention.

Templates: The Chair provides templates for the handout for the initial discussion (LaTeX, MS Office, Libre Office), talks (LaTeX, MS Office, Libre Office), and thesis (LaTeX). The templates can be downloaded on the website of the Chair. Their use is compulsory.

Important Dates and Deadlines - a Check-list: The following check-list gives an overview on all tasks and steps needed to complete the thesis. The steps are described in more detail later on in this document. The list is not intended to be exhaustive.

Before the official registration the student has to...

- ...decide for a topic and familiarize with it
- ...prepare for and accomplish the initial talk
- ...prepare paperwork for registration:
  - fill in a contact form for cases where the Chair needs to contact you

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1In the following we only use the female forms of pronouns for brevity and clarity.
2http://www.in.tum.de/fuer-studierende-der-tum/bachelor-studiengaenge/informatik/abschlussarbeit.html
3http://www.net.in.tum.de/de/studentische-arbeiten/hinweise-zu-studentischen-arbeiten/
– sign contract which allows the Chair to use your contributions for further scientific purposes
– fill in the documents for the official registration of the thesis
• register for the mailing list of the Chair\(^4\) in order to get informed about network related talks during (and after) the time of your thesis

**After the thesis has started officially** the student should . . .

• . . . structure the planned work and update the plan regularly when necessary
• . . . regularly meet with the advisor to report about the progress
• . . . confirm that decisions taken and changes in the working plan are in conformance with the advisor
• . . . explicitly ask for help if problems occur
• . . . set up a date for the first talk in front of the Oberseminar together with the advisor
• . . . give the talk

**In the second half of the project** the student should . . .

• . . . present an outline for the thesis and discuss it with the advisor
• . . . start writing the thesis
• . . . try to get feedback on chapters or a full draft of the thesis from the advisor

**In the last week** the student should . . .

• . . . plan the last steps, containing reviews, the printing, the delivery, etc.
• . . . hand in the thesis (mind the deadlines!)
• . . . set up a date together with the advisor for the final talk

**After delivery of the thesis** the student has to . . .

• . . . finalize the documentation of the work (code, digital literature, source files of graphics, source files of the thesis, measurement results, etc.) and hand it to the advisor
• . . . try to discuss the slides of the final talk and get feedback
• . . . give her final talk
• . . . use the chance and get feedback by evaluating the student project in a discussion with the advisor and eventually agree on some proceeding work
• . . . and finally return keys, key cards, and other working material

Details on the listed tasks are provided in following.

**Initial Discussion and First Talk:** The student has to participate in an **initial discussion** with the supervisor and the advisor(s). This discussion takes place before the student registers her work at the examination office, typically about three weeks after starting with the familiarization with the problem. In the initial discussion the student documents her understanding of the problem and allows the supervisor and advisor(s) to comment on the project, give some advise or suggest further ideas. The student has to fill in a cooperation agreement latest after this talk at our secretary. This includes a contract about further utilization of the student’s work executed under the guidance of the advisor as well as a contact form for eventually required inquiries.

A **first talk** needs to be given publicly at our Oberseminar (Tuesday or Wednesday, 4pm). This talk is typically given at the end of the first half of the working period. In this talk the student presents the

\(^4\)http://www.net.in.tum.de/de/mailingliste/
research project and gives first solutions and documents her plans for the second half of the working period. Feedback given by the audience will help with successfully finishing the work.
The handout for the initial discussion resp. the slides for the first talk need to contain:

- Addressed problem and its motivation (handout/talk)
- Research questions (handout/talk)
- Planned steps to address the named problem (handout/talk)
- Rough schedule, i.e. initial familiarization with the problem, analysis, design, implementation, evaluation, writing, etc. (handout/talk)
- Problem analysis (talk only)
- Approach to the problem and first solutions (talk only)
- Planned final steps (talk only)

The intended time frame for the first talk is 10 (Bachelor’s Thesis) resp. 15 (Master’s Thesis) minutes plus 15 minutes for discussion.

Performing the Work: Student research projects are typically embedded into a larger research project of the Chair. The success of the work is therefore important for both parties, student and Chair. Therefore it is highly important that student and advisor(s) meet periodically, e.g., biweekly, and work “hand in hand”. The student needs to prepare for these meetings and present progress since the last meeting and planned next steps. The advisor gives suggestions and directs the work. The language of the components (i.e. Thesis, Handouts, Talks, Discussions) is typically - and not necessarily unique - German or English.
Nota bene: Aside from contributions of the research work and quality of the thesis, the way the research work was performed (quality of preparation for meetings, interaction with other participants in the embedding research project, soundness of planned next steps, timeliness, self-independence, . . . ) is part of the final grade.

Thesis (“Ausarbeitung”): The thesis documents the work of the student, is one of the most important parts of the project and an integral part of the final grade. For this reason, the thesis needs to be written with great care. One of the most important tasks of the advisor is to support the student in the writing process. Nevertheless we assume that the student prepares herself using books on language and style, or in the Web.
At least two months before submitting the thesis, the student needs to prepare a well-structured skeleton. Content and purpose of individual chapters and sections need to be defined. This skeleton is discussed and refined with the advisor. The thesis needs to contain:

- Problem and motivation of the research work
- Research questions
- Problem analysis
- Approach to the problem and developed solutions
- Information about the implementation
- Evaluation of the solutions
- Distinction to and progress beyond Related Work
- Final conclusion (i.e. summary of the achieved results and description of future work)

At least two weeks before submission, the student needs to send a complete draft version to the advisor(s). The advisor(s) look through the thesis and give final suggestions for improvement.

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Nevertheless this is not a trial and error correction feedback for the student but rather feedback to support the student’s effort for a good scientific work.
The student needs to hand in a printed and bound version of the thesis to the Chairs library, a version to the examination office, and a version for the advisor(s). Depending on the addressed problem, a typical Bachelor’s theses comprises 40 - 80 pages, and a typical Master’s theses 60 - 120 pages.

**Defense ("Abschlussvortrag"):** The final talk marks the official end of the student research project. In the talk the student presents:

- Problem and motivation of her work
- Research questions
- Problem analysis
- Approach and solution of the problem
- Evaluation of the solution
- Distinction to and progress beyond Related Work
- Final conclusion

With this talk the student presents her contributions to supervisor and staff members and gives an opportunity to the audience to question contributions, methodology, evaluation, etc. The final talk is an important opportunity for the supervisor to get an impression of the quality of the performed work. The intended time frame for final talks are 20 (Bachelor’s Thesis) resp. 25 (Master’s Thesis) minutes plus 20 minutes for discussion.

At this place we want to motivate our students to prepare a demonstration. To exclude surprises we suggest creating a demo video (screen cast) that can be presented after the talk. In conformance with the advisor, the student may get additional time for the demo.

**Video Recording** Our Chair offers to record talks held in our “Oberseminar”. These are published on our media server. Videos can have different access levels from private (only the student can watch), to chair stuff, TUM members, or fully public. The student can change the level of access at any time after the talk. The recording can be used to improve the own presentation skill as well as for referencing on the talk in later job applications. Therefore we recommend to use this opportunity.

**Grading:** The final grade of the research work consists of three elements:

- Contributions (quality of solution, quality of scientific work, completeness, …)
- Thesis (structure, completeness, scientific quality, i.e. analysis, evaluation, distinction to related work, …)
- The way work was performed (being well prepared, sound structuring of work, independent work, reliability, …)

The advisor(s) assess the quality of the performed research work according to these criteria and propose a grade. The supervisor has the final decision on the grade.

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7 [http://media.net.in.tum.de/](http://media.net.in.tum.de/)
Rights and Obligations: We offer **infrastructure** that may be helpful for students doing a thesis at our Chair. These include IT-infrastructure, such as version control systems (SVN, GIT, Mercurial), student workstations, experiment servers, printers, or special software. TUM offers subscriptions to various scientific publishing sites (Springer, ACM, . . . ) that you can use to obtain papers free of cost\(^8\). We also provide offices and work areas for students. If the student plans to do parts of her thesis at University, a conduct through our Chairs accommodations can be requested. In special cases a key card or key can be handed out to the student. An account for our coffee system allows for buying coffee and other drinks in our kitchen. If the student feels the need for anything that is not offered automatically (infrastructure, working material, literature) she is welcome to ask the advisor for it. Students that use our offices, work stations, etc. need to **obey some simple house holding rules**, such as keep the work space clean, close windows, turn off lights and heating when leaving, . . . . The rules are hung out in our rooms. We want to highlight that putting away used dishes into the dishwasher and keeping the kitchen tidy is one important rule for using it.

Furthermore each student is requested to create and update a wiki-style homepage of her work for our research wiki. Additionally, code needs to be documented, ideally using a code documentation tool\(^9\). All working documents, like graphic sources, code, used digital literature, measured results, etc. should be handed to the advisor in an useful manner at the end of the thesis.

Give Feedback: We also encourage our students to give feedback to us. Is there something we can do better? Is there anything you were missing?

\(^8\)http://www.ub.tum.de/eaccess
\(^9\)e.g. http://www.stack.nl/~dimitri/doxygen/