What you should know about
Forschungsthemen der Informatik
Research Topics of Computer Science

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Please also consult the module handbook!

The purpose of the lecture „Forschungsthemen der Informatik“ is to give you an idea about current research topics in Computer Science (including current research projects at the IFI and VAC in Rostock), to get an in-detail view into two areas of research, and improve and demonstrate your skills in writing a scientific report.

The 10 page report mentioned in the module description is in fact 2 independent reports of about 5 pages each. The following will give you some further information about what we expect in these reports.

The two reports shall serve as preparations for writing a Master thesis, to improve your skills in analyzing scientific papers, pursuing research questions, and in writing scientific papers, and they will give you the opportunity to check for yourself whether a Master’s degree in Computer Science at the University of Rostock is the right choice for you. Therefore it is important that you actively take part in the lecture, ask questions during the lecture, and take the writing of the reports seriously.

During the 12 week lecture, each professor will present his or her area of research. At the end of the lecture, you will be able to select for one of the reports an area of research according to your own interests. Please e-mail the name of the professor to Frau Fengler (roswitha.fengler@uni-rostock.de). The deadline for submitting your choice is the end of the week (Sunday, midnight) of the last lecture. If you have not submitted your choice in time, Prof. Wolf will assign the topic for your first report. The area of research for your second report will be assigned by Prof. Wolf.

Typically you will receive an e-mail from Prof. Wolf with two areas and the names of the respective advisors two weeks after the end of the lecture. You should then contact the assigned advisors as soon as possible and ask for further specification of the topic. You will have 7 weeks to prepare the reports.

Whereas the specific topics and tasks are determined by the respective advisors, all reports are evaluated according to the same criteria. It is rather the “how you write it” than the “what you write about” that matters. The length of each report should be about 5 pages in the following two-column format:

In addition to fulfilling the assigned tasks, and the scientific merit of your report, the following criteria will contribute to the evaluation of your report:
Spelling and grammar is correct, the report is well-structured.
All sources are correctly cited and referenced. The main sources are scientific articles, preferably recent ones.
The paper combines and relates the contents of different sources.
Your paper does not plagiarize other content in any way. (Please note plagiarism will lead to your report being not accepted. The case will also be reported as unethical conduct to the Examinations Committee of Computer Science, which, particularly in case of repeated ethical violations, might consider further sanctions up to exmatriculation).

Please also note that typically your report will not be reviewed before submission. You shall demonstrate that you are able to solve the tasks assigned to you, to analyze scientific papers, and to write an acceptable scientific report on your own. However, all advisors will be happy to help if you have specific questions regarding the content of your paper.

Information how to write a scientific report can be found on the web, examples are:

https://researchguides.njit.edu/c.php?g=671658&p=4727571
https://writingcenter.unc.edu/tips-and-tools/

In the following we enlist tasks and expectations from various research groups, and from which you might also extract some further information what writing the reports is all about.

Chair DBIS (data bases and information systems) (Prof. Heuer)

- 2 pages survey on the research topics which had been presented in the lecture.
- 2 pages detailed description of a research project at the chair, as selected by the student. This contains the research problem as well as a solution; in addition to the slides from the lecture, the chair provides a relevant publication from their group.
- 1 page description of an open research problem in this project. Sole source for this is an interview of one hour duration which the student can conduct with Prof. Heuer and a collaborator in the research project.

Chair IuK (Information and communication services) (Prof. Cap)

- Describe a research questions whose solution you deem interesting. The research areas which the chair presented in the lecture provide suggestions, but you can be creative as well, so long as the topic is within the research area of the group.
- Explain, why this research topic is important in scientific or industrial research.
- Explain which aspects of the research questions have already been treated in the literature and which are still unsolved. We expect the students to do a short literature review on their own.
- Explain why you personally find this particular research question so interesting.
Chair MoSi (Modeling and Simulation) (Prof. Uhrmacher)

- Please select one of the presented research topics in modeling and simulation that is of particular interest to you. We will give you one paper from the selected area as a starting point for writing your report.
- Please summarize within one page the content (incl. scientific question, approach, results) of the paper (~1 page)
- Select 2 papers that have been cited in this paper.
- Analyze and describe their relation to the first one (~2 pages each).

Chair MMIS (Mobile Multimedia Information Systems) (Prof. Kirste)

- A particular method is selected from the ones presented in the lecture. The report shall present this method according to the following structure 1) Motivation, 2) State of the Art & Challenges, 3) New Method / Approach, 4) Evaluation and Results, 5) Discussion.
- All claims in (1)-(5) should be supported by the literature, preferably by giving appropriate citations. In your case, the literature would be the lecture slides and the references given in the lecture slides.
- In addition, technical detail should be provided appropriately in all of the sections. This means that in section (2) you describe a well-posed problem (essentially, a problem is well posed, if you have defined a mechanical procedure for testing whether or to what degree a proposed solution solves the problem). Then in section (3) you describe possible solutions in enough detail so that it is clear what algorithmic strategy is used by the solution to solve the problem. Finally, in section (4) you analyze the results of applying the solution to the problem and measuring the level of success.

Chair SBI (Systems Biology) (Prof. Wolkenhauer)

First you need to find a question that you are actually interested in. We are interested in research related to mathematical modelling with applications in the biological and medical sciences, where the models have their origin in machine learning, systems theory, and graph theory. For example, you can ask yourself a question about machine learning models for classification, deep learning models for image analysis, statistical models for decision making ... choose a narrowly defined question that you find yourself interested. Do not make the question too broad. For example, when it comes to classification, you may find imbalanced datasets interesting, and then identify one focused question related to this. For the structure, there are many approaches you can follow, one possible is 1) introduce the topic to the reader and explain what you are trying to achieve, 2) Review the relevant literature and introduce different approaches. If you feel confident, don’t shy away to make personal statements about your judgement of the issues. 3) Present data and results, objectively and factually, 4) Identify any weaknesses, discuss challenges and opportunities. – 5) Conclude with a summary and conclusions. Provide references for your text, ensure you cite them properly (detailed information can be found in the text “How to write a scientific essay.” By Olaf Wolkenhauer)

Chair TI (Theoretical Computer Science) (Prof. Wolf)

The lecture captures two areas of research (Petri net verification and algorithms for open systems (services)). You may choose one of the two areas and

- Give a short summary of the lecture in your own words
- Do a literature survey on recent developments in the respective area
Chair WIN (Business Informatics) (Prof. Sandkuhl/Prof. Fellmann)

Three research questions in a specific research area of business informatics will form the starting point for writing your report. After an introduction and short literature review of this research area the research questions shall be used to structure the report. It is clearly stated what is the motivation, the problem and most important, which questions are answered in the report. The report provides a balance of depth and breath, i.e. there is a short general introduction to the topic as well as some more in-depth comments and elaborations in the main part. In the end, a conclusion is provided in which there is a thoughtful reflection on the previous elaborations and findings. Also, do not forget to include your own, personal insights in the conclusion. Finally, you may provide some short comments on possible future research needs.

Chair VA (Visual Analytics) (Prof. von Landesberger)

Please select one of the presented research areas in visualization that interests you. We will give you one paper from this area as a starting point for writing your report. Based on this paper, select 2-3 more papers that are related and discuss how they are related, and compare the approaches. In VA, papers that present new algorithms, applications, systems, evaluation, design study, or a survey can be distinguished (see also http://ieeevis.org/year/2020/info/call-participation/vast-paper-types). With the type of paper, the question your report will answer will vary. For example, if a new algorithm is presented, then it is central to look carefully, how the algorithm advances the state of the art and how this is shown. For application papers, the specific requirements of the application are the starting point for any research. Design studies focus on visualization design, they are developed for specific data and queries the user would like to have answered, here it is interesting how requirements, design options are related. Evaluation papers compare different techniques, here the criteria that are used for comparison (or benchmarks) are of central interest. Depending on the type of paper, summarize the problem addressed, the approach and the result of the paper. Include your own views on the approach and result, and critique of the presented approach. Include ideas for application of the proposed approach and/or further ideas.

Chair VC (Visual Computing) (Prof. Staadt)

- Please select one of the presented research topics in visual computing that is of particular interest to you. We will give you one paper from the selected area as a starting point for writing your report.
- Please summarize within one page the content (incl. scientific question, approach, results) of the paper (~1 page)
- Select two papers that have been cited in this paper.
- Analyze and describe their relation to the first one (~2 pages each).