Student Research Projects

Study Year 2023/2024

Daniela Thyssens

Information Systems and Machine Learning Lab (ISMLL)
Institute for Computer Science
University of Hildesheim, Germany

Outline

1. Aims

2. Timeline

3. Proposal

Student Research Projects
Study Year 2023/2024

for whom?

- ▶ International Master in Data Analytics (mandatory)
- ▶ all IT Master and Bachelor programs (elective)
    - ▶ Applied Computer Science
    - ▶ Information Management and Information Technology (IMIT)
    - ▶ Information Systems

1. Aims

2. Timeline

3. Proposal

Outline

Aims

1. Students conduct a small well-defined research project
   - ▶ in a small group of 4-5 students
   - ▶ under supervision of a PhD student

2. Students read the literature and comprehend the state-of-the-art in a specific subject of data analytics.

3. Students conduct a computational experiment on their own.

4. Students have the opportunity to extend the state-of-the-art with an own innovation.

More Aims

5. Students learn and practice how to write a short research proposal.

6. Students learn and practice how to conduct a small research project together with partners.

7. Students work on a real problem with real data.

8. Students have fun.

Project Requirements

1. **Problem Setting**:
    - ▶ a crisp, specific problem setting
    - ▶ that can be tackled with methods from data analytics.

2. **Data Foundation**:
    - ▶ data that allows to evaluate and compare different solutions of the problem.

3. **Tangible Outcome**:
    - ▶ a workshop paper, an open source software project etc.

Work Load

- ▶ 15 ECTS, stretched over 2 terms

- ▶ $15 \times 30h$ / student $= 450h$ / student

- ▶ 1.25 days each week over a year

- ▶ for a team of 5 students: 15 person months

- ▶ you likely want to organize project work
  - ▶ in sprints during term breaks and
  - ▶ continuous, but slower progress during terms.

Research Areas and Project Topics

▶ Every year, we open **research areas**
  ▶ covering interesting actual research topics
  ▶ we know well enough to supervise you

▶ You can apply for a **topic** within the proposed research areas.
  ▶ we may point out different example topics within an area
  ▶ it is **your job to shape a useful topic** within one of the proposed areas

Outline

1. Aims

2. Timeline

3. Proposal

Timeline

Today — Introduction to student research projects

- enroll to the Learnweb course 3114
- chose your area
- build your team and
- write your research proposal

15.03.2024 — Deadline for proposals

22.03.2024 — Notification & start of projects

- work on your project

June — 1st interim presentation (usually the 1st Thursday)

October — 2nd interim presentation (usually the 1st Thursday)

- work on your project
- prepare a final presentation

December — 3rd Annual Student Research Project Conference
            (usually the 1st Thursday)

Outline

Proposal

| section	length
1. Problem Setting	0.5 – 1 page
2. State-of-the-Art	0.5 – 1 page
3. Data Foundation	0.25 – 0.5 page
4. Research Idea	0.5 – 1 page
5. Tangible Outcomes	1 sentence – 0.5 page
6. Work Plan	0.25 – 0.5 page
7. Resources	1 sentence – 0.25 page
8. Team	0.25 – 0.5 page
A. References	no limit
	3 – 5 pages

▶ Sections are recommendations, you can section in a different way.
  ▶ but make sure you provide clear answers to the questions w.r.t. these 8 aspects
▶ Page limits are indicative, you can write more or less. However, this is the ammount expected for each one of those.

Proposal / 1. Problem Setting

- ▶ What is the problem you want to solve?
- ▶ Describe the problem in words and
- ▶ formally
    - ▶ given x, find an instance of type y with properties z
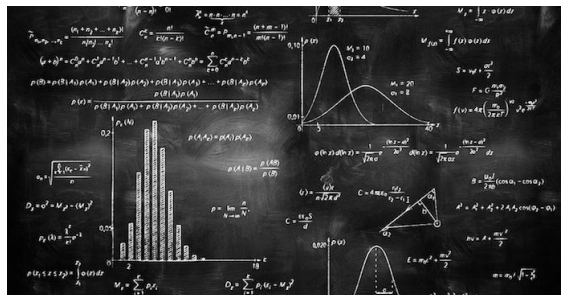
Proposal / 2. State-of-the-Art

▶ If others have tackled the problem already:
  ▶ Which solutions exist?
  ▶ What are their properties? What their limitations?

▶ If the problem is completely novel:
  ▶ What are simple/straight-forward solutions and what are their
    limitations?
  ▶ What are the most closely related problems and how are they different?

▶ Provide complete references.

Proposal / 3. Data Foundation

▶ What data is (publicly) available for your problem?
  ▶ provide references
  ▶ provide brief summary statistics

▶ Do you plan to collect data as part of your project?

Proposal / 4. Research Idea

- ▶ What do you plan to do? e.g.,
    - ▶ reproduce an experiment from the literature
    - ▶ combine two methods from the literature
    - ▶ research a new idea / method

- ▶ Which experiments do you plan to run?

Proposal / 5. Tangible Outcomes (1/2)

- ▶ What tangible results will your project have?
- ▶ All projects should result in some written **documentation** (pick one)
    - ▶ a workshop paper submission
        - ▶ usually 8-16 very compact pages
        - ▶ identify a workshop or conference already
    - ▶ software documentation
        - ▶ not just API documentation, but a story about requirements, design, implementation etc.
        - ▶ approx. 30 pages
    - ▶ a business plan
        - ▶ for a start-up company
    - ▶ a project report
        - ▶ describe what you did, argue your choices etc.
        - ▶ approx. 40 pages
        - ▶ Hardly the option that gives a 1.0

Proposal / 5. Tangible Outcomes (2/2)

▶ Most projects also should result in some **software prototype**
  ▶ open source software project
  ▶ an internal prototype just for you and us

▶ but your project could have other types of tangible outcomes, too:
  ▶ a demo
  ▶ a tutorial
    ▶ as webpage or as video
  ▶ a website or a webservice
  ▶ a MOOC

Proposal / 6. Work Plan

▶ Structure work in tasks or work packages.

▶ Provide a time-wise planning.

▶ Describe task dependencies.

▶ A rough planning should be fine
  ▶ maybe 4–5 tasks

▶ if you plan to write some software:
  ▶ will you build on top of an existing software?
    ▶ identify what is still missing
  ▶ which libraries are you using?
  ▶ have you decided about the programming language already?

Proposal / 7. Resources

- ▶ Which resources do you need?
    - ▶ computing time
    - ▶ hardware
    - ▶ conference fees
- ▶ Estimate total costs in euros.
- ▶ We likely cannot provide very large sums.

Proposal / 8. Team

- ▶ Who is in the team with which role?
- ▶ What are your prior expertises?
  - ▶ Machine Learning 1 is a formal requirement for **all** team members.
- ▶ We expect each team to bring members from 3 different countries.
- ▶ Why are you a good team to conduct the project?
- ▶ Provide a contact email.

Submitting Your Proposal

▶ you can discuss an idea and a draft of your proposal with potential supervisors up front

▶ the submission deadline is strict.

▶ we will assess your proposal and either
  ▶ accept it as it is,
  ▶ propose some modifications that should help you to stay on track or
  ▶ reject it, esp. proposals
    ▶ that make absolutely no sense,
    ▶ are very vague,
    ▶ are written in a careless way and
    ▶ without any prior consultation
    ▶ we may offer specific replacement topics on a take-or-leave-it basis

A Word About Grading
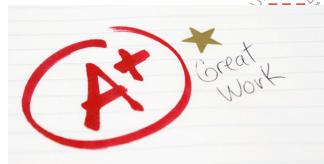
▶ final grading will depend on
  ▶ did you address a challenging problem or a more down-to-earth one?
  ▶ how clever the solution is you finally found
  ▶ the quality of your proposal
  ▶ the quality of your tangible results
    ▶ how well is a workshop paper written?
    ▶ is an open source software used by others?
    ▶ does a software prototype work well or segfault?
  ▶ how well you worked
    ▶ did you flexibly deal with issues on the way?
    ▶ a project is not about sticking to the initial plan.