Seminar in Empirical Software Engineering

Session 2
Agenda for today’s session

- Introduction to scientific writing in the seminar
- Paper submission and review process
- Seminar work topics
Scientific writing

- Scientific text aims to convey to the reader
  - The questions a researcher has investigated
  - How the questions were investigated (research method)
  - What results were obtained
  - What the implications of the results are
- Learning scientific writing means learning to express thoughts with particular clarity and communicate them so that experienced researchers can follow them
- Each scientific discipline and sub-discipline has its own traditions and conventions for scientific text
General properties of scientific text

- **Audience**: Scientific text is read by people who already know the basics. There is no need to explain textbook-level material.

- **Clear concepts**: Special care is taken to define things precisely. Complex constructs are especially important to define. All concepts are used consistently throughout the text.

- **Claims or arguments**: Claims are justified. References to other work, careful arguments, and evidence are used to show what claims are based on. Do not misrepresent referenced work!

- **Your work and others’**: There is a clear distinction between the author’s contribution and work made by others. Care is taken to attribute work to the original author(s), but also to highlight one’s own contributions.

- **Storyline and structure**: Scientific text has a clear and consistent storyline which is easy for the reader to follow. Not a novel, however!
Paper structure

• General structure: IMRAD
  • Introduction
  • Methods
  • Results, and
  • Discussion
• This structure helps readers and writers to navigate the text
• There are other possible structures but in this seminar, we will apply this structure
Introduction

• Nature and scope of the study:
  • What is the “problem” and why is it important to study?
• Key references
• Research questions (usually if motivated from practice, can also be in Methods)
• Give the reader a reason to continue reading!
• In many articles, the introduction also follows the IMRAD structure but in a shorter form with fewer details
Methods

• The method is the logic of the study
  • How does the study address its research question(s)?
  • Full details on study design, sample, data collection, etc.
• When doing a literature review, include details on search strings and list which databases were used
• A good method description allows others to replicate the study
• Many methods are documented in the literature and appropriate references should be made
  • However, each study has to provide its own details because there are many choices along the way
• Research questions (usually if they address a gap in the literature)
Results

• **What results were found?**
• Show the data relevant to the research question(s)
• Stay with the results, do not discuss or comment yet
• Often results are best presented with tables and figures
  • Tables and figures are free-standing elements that can be read separately from the main text (with the caption)
  • All tables and figures need to be explained in the text
Discussion

- Discuss the results
  - How well were the research questions answered?
  - Can the results be generalised and with what limitations?
- Validity
- Comparison to related work
- Generalisability
- The exact structure depends on the topic and results, but organised according to some logical structure
Paper structure: overview

Abstract
- Context
- Objective
- Methods
- Results
- Conclusions

Introduction
- Previous work
  - Existing research
  - Other work (background, motivation)

Methods
- Data the work is based on

Results
- Analysis
  - Neutral, based on the data

Discussion
- "no more new results"
- of the results, how well RQs were answered, limitations

Related work
- Comparing the results to related, similar work

Conclusions
- Main point / message, future work

Introduction leads to, motivates
- Results give answer(s)
- At the end, discuss your answers

What was done, investigated
- What is the problem that the work provides an answer (to some extent)

Tomi Männistö

Seminar in Empirical Software Engineering / Fabian Fagerholm
Paper structure: more detail

- An actual paper has more structure
  - Title
  - Author and affiliations
  - Abstract
  - Meta-information (e.g. keywords)
  - Introduction
    - Aims, research questions
  - Methods
  - Results
  - Discussion
  - Conclusions
  - (Acknowledgements)
  - References
- In some papers, the order of sections is different
Exercise

• Form groups of 3-4
• Pick any software engineering-related paper
• Identify the structural elements

• Are there any similarities to / differences from the IMRAD structure?

IMRAD

• Title
• Author and affiliations
• Abstract
• Meta-information (e.g. keywords)
• Introduction
  • Aims, research questions
• Methods
• Results
• Discussion
• Conclusions
• (Acknowledgements)
• References
The writing process

• People differ in how they get text on paper
• Usually, it is a good idea to start early and write every day
• A logical paper structure helps to find where to put your text
  • Start by setting up the paper template, creating the main sections, and a page budget for each section
• Writing as you read allows you to capture relevant information from related work
• Writing is iterative: alternate between writing and revising
  • Read text you wrote yesterday
  • Improve it (e.g. move it to a different location, make it clearer)
  • This may help you get back on track with writing every day
The writing process

- The order of writing does not necessarily follow the paper structure
  - The *research question* is typically the first thing to consider
    - It scopes the topic and directs your literature search
    - You need to read related literature to understand what material is available
  - Next, writing the *method section* will give you a plan for what you are doing
  - Then, conduct the actual literature search or study
  - Then, write the *results*
  - Then, write the *discussion*
  - Then, write the *introduction*
  - Then, write the *abstract*
- *You will need to iterate* to find the final form
  - Even the title might change as a result of your increased understanding
The extended abstract

- The extended abstract is a version of your paper which has fewer parts, e.g.
  - Title
  - Author and affiliations
  - Abstract *with expected results*
  - Meta-information (e.g. keywords)
  - Introduction
  - Method
  - Discussion of expected results
  - References
- The extended abstract must be written using the same template as the final paper
- The extended abstract allows
  - You to plan what you are going to write and how
  - Others to determine whether they would be interested in reading the final paper
  - Others to give feedback on your paper plan
- It also helps you get started with the writing
Resources

- Scientific writing guide
  - Attempts to summarise conventions and advice relevant to the empirical software engineering field
  - Work in progress, please comment!
- Paper template (see seminar home page)
  - LaTeX or Word (use A4 paper size)
  - Set this up for the extended abstract as soon as possible
Submission and review process

- Phase 1: Extended abstracts
  - Submit your extended abstract before the deadline (September 28)
  - You will receive an invitation to bid on papers which you are interested in (October 19)
- Phase 2: Full papers
  - Submit your full paper before the deadline (November 9)
  - You will receive an invitation to review papers based on your bids
  - You will review 3 papers (this may change depending on the situation) (November 23)
- Please keep the deadlines!
Reviewing papers

• The purpose of a review is to determine if the paper is good enough for publication (in the seminar, good enough to pass)
• A good review also gives constructive advice for improvement
• Read the paper
  • Take notes or mark your observations in the margin/in the file
• Write your review
  • Start by summarising the paper in 1-3 sentences, e.g. “This paper reviews research literature on test-driven development, particularly focusing on its impact on code quality. The paper uses a systematic literature review method. The paper finds that the evidence on test-driven development is ...”
  • Shortly summarise the strengths and weaknesses of the paper
  • Give more detailed reasons for your recommendation
  • Last, list minor issues
## Review criteria

<table>
<thead>
<tr>
<th></th>
<th>Characteristics of a good seminar paper (= grade 3)</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem setting</strong></td>
<td>Goals or research questions are not motivated or connected to practical SE problems. Research questions is ambiguous or link to the contents weak.</td>
<td>Aims are clear. The scope is well defined and appropriately set. Research problem is well motivated in Introduction.</td>
</tr>
<tr>
<td><strong>Background</strong></td>
<td>References are scarce and they are of low scientific quality or the selection of references is inadequate. Literature is mainly referred to one by one (author centricity) and analysis is weak across sources.</td>
<td>There is an adequate number of references (in a seminar paper 4-10 depending on the topic). The essence of the literature is nicely captured and consistently described. The analysis of the literature shows critical thinking and maturity.</td>
</tr>
<tr>
<td><strong>Structure</strong></td>
<td>The structure is inconsistent and unclear. Headings do not reflect the content or the ordering of the content is not logical.</td>
<td>The structure is clear and forms a clear storyline.</td>
</tr>
<tr>
<td><strong>Results and Conclusions</strong></td>
<td>The results are separate or presented unclearly. The connection between the research questions and results remains vague. Conclusions are overly general, unconvincing, have flaws or the relation to results is vague.</td>
<td>The paper presents good results that are based on the data used. Conclusions are clearly stated and based on the results.</td>
</tr>
<tr>
<td><strong>Presentation and language</strong></td>
<td>There are flaws in the presentation, the text is hard to read and follow. There are errors in the usage of literature references. The work contains noticeable spelling or grammar errors. The language is not exact, e.g., the use of key terms is inconsistent.</td>
<td>The language is good and the work is well Polished. Literature references are used correctly and consistently. The list of references is formatted consistently and according to the instructions (or template).</td>
</tr>
</tbody>
</table>

Tomi Männistö
# Review criteria

## Scores

<table>
<thead>
<tr>
<th>Value</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>-3</td>
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<tr>
<td>-2</td>
<td>Reject</td>
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<tr>
<td>-1</td>
<td>Weak reject</td>
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<tr>
<td>0</td>
<td>Borderline paper</td>
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<tr>
<td>1</td>
<td>Weak accept</td>
</tr>
<tr>
<td>2</td>
<td>Accept</td>
</tr>
<tr>
<td>3</td>
<td>Strong accept</td>
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## Additional Criteria

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<th>2</th>
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<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem setting</td>
<td>Passable</td>
<td>Satisfactory</td>
<td>Good</td>
<td>Very good</td>
<td>Excellent</td>
</tr>
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Submission system

• All submissions, bidding, and reviews are handled using EasyChair
  • https://easychair.org/conferences/?conf=eses2016
  • The submission system will open after next week’s session
  • The system relies on a combination of email notifications and a web interface, so make sure you read your email once the submission process starts
Exercise: Topic development

- Split into groups with 3-4 persons
- Each person presents one idea in turn and the group helps to analyse it
  - Ask clarifying questions: what does the topic mean?
  - Search for literature: is there any work on the topic? What methods have been used in the literature? What results have been found?
  - Refine the terms: do articles use different words for the same thing?
  - Are there any related topics of interest mentioned in the articles?
  - Is this a feasible topic for a seminar work?
- Record your progress by taking notes on the topics
- Repeat the process until you have analysed all the topics
Exercise: topic brainstorming/development

- Summary from each group
- Discussion about topics and how to choose one
Next session
September 21

• Preparing a presentation
• On literature reviews

• Homework:
  • Begin working on the extended abstract
  • Especially try to scope the topic by writing out a research question / some research questions
  • Also find literature to help you understand the topic