



Department of Computer Science Institute for Software and Multimedia Technology, Software Technology Group

Software for Digital Health

Scientific Writing

Hauptseminar (WS 18) Tuesday, 5. DS, APB/2101 Thomas Kühn (thomas.kuehn3@tu-dresden.de)



Organization Doing Science is Hard?







Most scientists regarded the new streamlined peer-review process as "quite an improvement." Cartoon by Nick D Kim strange-matter.net. Used by permission.





- *Give scientific presentations* (20 min + 10 min discussion)
 - Individual presentations **08.01.2019**
- Write a research paper (>=5 pages ACM Style)
 - Paper submission¹ **01.02.2019**
- 1) Per mail





- Pick a research topic within **software for digital health**
- Work alone
- Give a presentation on your topic
 - 30 minutes presentation
 - Practice giving presentations
 - Follow the advise provided throughout the next lecture
- Writing a research paper
 - >=5 pages two column paper
 - Preferably use LaTeX
 - Style: ACM SIGPLAN Conference Format (acmart)¹
 - Apply the skills learned throughout this lecture
- 1) http://www.sigplan.org/Resources/Author/







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Paper Writing Process Overview



Common Tasks

- Iterative process from idea to written paper
- Develop "Ziel-orientierte Projektplan" (ZOPP)
- Write an **abstract** early
- **Structure** your paper *(chapters, sections, paragraphs)*
- Write **outlines** for each chapter, section, ...





Mindmap with four arcs capturing the main idea of your paper

What *problems* does your paper address?

• Pick one main problem and add detailed subproblems

What are the corresponding *goals* of your paper?

• Align goals and subgoals to problems you address

What *solution* does your paper present?

• List your solution and subsolutions aligned to goals

What are *success criteria* or how to *evaluate* your solution?

- Specify *functional* and *non-functional* requirements
- *Evaluate* whether solution achieves goals





- Derived from a ZOPP
- State the *problem* in one or two sentences including your *goal*
- Highlight your *solution* in one or two sentences
- State your *success criteria* or how you *evaluate* your solution

"Currently, CROM models can be created textual or graphically without taking the well-formedness rules for these models into account. Hence, the goal of this work is to create a Eclipse-based plugin, which validates CROM models with respect to well-formedness. Additionally, the plugin should be easy to integrate into the existing editors."

– Kühn (2015)





- Includes the *problem definition* as crucial part
- Prepends a **background** of this research (*Why is it important?*)
- Summarizes the major problems and goals
- Appends a description of your evaluation (success proof)





"Modelling context-dependent domains is hard, as capturing multiple context-dependent concepts and constraints easily leads to inconsistent models or unintended restrictions. However, current semantic technologies not yet support reasoning on context-dependent domains. To remedy this, we introduced ConDL, a set of novel description logics tailored to reason on contextual knowledge, as well as JConHT, a dedicated reasoner for ConDL ontologies. ConDL enables reasoning on the consistency and satisfiability of context-dependent domain models, e.g., Compartment Role Object Models (CROM). We evaluate the suitability and efficiency of our approach by reasoning on a modelled banking application and measuring the performance on randomly generated models."

– Böhme et al. (2017)





Recurring structure of scientific papers in computer science

- Introduction / Motivation
- Background / Preliminaries / Contemporary Approaches
- Concept / Methodology
- Implementation / Realization
- Evaluation / Case Study / Illustration / Discussion
- Related work
- Conclusion / Contributions





Paper Writing Process How it feels like



Images from https://parske-shop.de/Gartentechnik/Haecksler/Erco-Holzhaecksler-GHX-CH1900-Zapfwelle-oder-Benzin.html



Paper Writing Process How it should be



Image from MaxPixel.net (Creative Commons by Markus Baumeler)





Common Tasks

- Structuring paper
 - Define chapters, sections, subsections
 - Summarize outline of each part
- Write individual paragraphs
 - Include individual artifact *images, tables, listings*
 - Outline points become individual paragraphs
 - Write a structured paragraph
 - Finalize paragraphs and transitions





- Employ *recurring structure* of scientific papers in computer science
- Define the structure by means of **headings** for *parts, chapters, sections, subsections, ...*
- Write short outlines/summaries for each heading
 - Use bullet points and short statements outlining the intended content
 - Which questions are answered?
 - What arguments are provided?
 - What solutions/conclusions are described?





Outlines

- Not written for the reader, but for you
- Summarizes intended content of *chapter*, *section*, *subsection*, and ...
 - What concepts/ideas must be introduced/discusses?
 - Which parts in your text cover which parts of your ZOPP?
 - What questions should be raised and answered?
- Helps to focus writing and avoiding running off the topic
- Useful to track writing progress





Outline Example

2.3. Graphical Editor Frameworks

- Give a short overview on typical frameworks for the development of graphical editors
 - Provide a clear description of the typical aspects that need to be implemented in such a framework, e.g. Language Concern (Metamodel), Editor Concerns, Edit Policies.
 - Describe GEF, GMF, Graphiti, Sirius, and EuGENia





Structured Writing Writing Individual Paragraphs

Include Artifacts

Images





Listings

Start Inheritance (Role_Inheritance) when
IsSourceType(RoleType);
Add Inheritance (Role_Inheritance) when
IsSourceType(RoleType) and IsTargetType(RoleType) and
SourceEqualsTargetType();
Create Inheritance (Role_Inheritance) when true;

- Start with sketches, low resolution images
- Later create scalable vector images (time consuming)
- Use generator for latex tables
- Refine/optimize table later
- Start with source code snippets
- Later remove all unnecessary statements





Structured Paragraph

- Write paragraph for each major point of the outline
- Typical structure of paragraphs
 - Thesis question
 - **Thesis statement** topic, purpose or development scheme
 - Supporting/opposing **arguments**, claims, evidence or warrants
 - Thesis conclusion and transition
- Enumerate arguments





Structured Paragraph Example

2.3. Graphical Editor Frameworks

There exists several graphical editor frameworks for all platforms.

As our prototypical GEPL is based on Eclipse, we focus on corresponding frameworks.

- 1) The Graphical Editing Framework (*GEF*) is the basis for most other frameworks, as it facilitates means to implement rich graphical Java applications.
- 2) The Graphical Modeling Framework (*GMF*) is a model-driven editor generator, where the various concerns are specified in interrelated models, e.g., the domain model, the graphical definition, and the tooling definition.
- *3)* EuGENia *and* Sirius *are both frameworks for textual respectively visual specification of GMF editors.*
- 4) Graphiti *utilizes EMF models to provide a uniform pictogram model linked to a custom domain model, whereas visualizations, behaviors, and edit policies must be manually implemented in IPattern and IFeature classes..*

None of them natively supports the modular definition of language features.





Finalize Paragraphs and Transitions

- Remove enumeration from structured paragraph
- Improve wording
- Link thesis question, thesis statement, and arguments with **transitions**
 - Additions: Moreover, furthermore, especially, in detail, ...
 - Cause & Effect: Thus, accordingly, as a result, consequently, hence, ...
 - (More in the appendix)
- Introduce transition and pivot sentences
- Add **controlling idea** to thesis conclusion





Finalized Paragraph Example

2.3. Graphical Editor Frameworks

There exists a **plethora** of graphical editor frameworks for all platforms, **yet** as our prototypical GEPL targets Eclipse, we focus on **associated** frameworks.

In general, the Graphical Editing Framework (*GEF*) is the basis for most other frameworks, as it facilitates means to implement rich graphical Java applications.

On top of GEF, there exists both model-driven and model-based frameworks.

For the former, the Graphical Modeling Framework (*GMF*) is a model-driven editor generator, where the various concerns are specified in interrelated models, e.g., the domain model, the graphical definition, and the tooling definition.

Moreover, EuGENia [@kolovos2017eugenia] and Sirius [@viyovic2014sirius] are both frameworks for textual respectively visual specification of GMF editors.

By contrast, Graphiti utilizes EMF models to provide a uniform pictogram model linked to a custom domain model, whereas visualizations, behaviors, and edit policies must be manually implemented in IPattern and IFeature classes.

Although these frameworks significantly simplify the design of graphical editors, none of them natively supports the modular definition of language features.





Cause and Effect

- accordingly
- as a result
- consequently
- hence

Conclusion

- as a result
- consequently
- hence
- in conclusion, then
- in short

- it follows, then
- since
- SO
- then

- in sum, then
- it follows, then
- SO
- the upshot of all this is that

- therefore
- thus

- therefore
- thus
- to sum up
- to summarize





Comparison

- along the same lines
- in the same way
- likewise
- similarly

Contrast

- although
- but
- by contrast
- conversely
- despite the fact that
- even though

Addition

- also
- and
- besides furthermore
- in addition

- however
- in contrast
- nevertheless
- nonetheless
- on the contrary
- on the other hand

- in fact
- indeed
- moreover
- so too

- regardless
- whereas
- while
- yet





Concession

- admittedly
- although it is true that

Example

- after all
- as an illustration
- consider

Elaboration

- actually
- by extension
- in short



- I concede that
- of course

- naturally
- to be sure

- for example
- for instance
- specifically

- that is
- in other words
- to put it another way

- to take a case in
- point

- to put it bluntly
- to put it succinctly
- ultimately







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Common Tasks

- Find relevant / related publications
 - Query scientific search engines
 - Look up *BibTex* for specific publications from the web
- Investigate found publications
 - Skim papers
 - Make notes and hints
 - Organize downloaded files
 - Maintain a corresponding bibliography of *BibTex* entries





A Small Survey

- Q1:What tools do you use to read and annotate papers?
- Q2:What tools do you use to organize your bibliography?
- Q3:What tools do you use to organize stored papers?

What tools do you use to read and annotate papers?





What tools do you use to organize your bibliography?







BibTex

```
@inproceedings{kuehn2015choosy,
  title = {Choosy and picky: configuration of language product lines},
  author = {K{\"u}hn, Thomas and Cazzola, Walter and Olivares, Diego Mathias},
  booktitle = {Proceedings of the 19th International Conference on Software
                    Product Line},
  year = \{2015\},
  organization = {ACM},
  pages = \{71 - .80\},\
  citations = \{1\},
  file = {:./Kuehn/Thomas Kuehn_Choosy and picky - configuration of language
            product lines.pdf:PDF},
  howpublished = {\url{http://dl.acm.org/citation.cfm?id=2791092}},
  owner = {thomas},
  timestamp = \{2015.09.07\}
```





Finding Relevant / Related Publications

- Query scientific search engines When looking for complex search terms
 - Google Scholar (free)
 - Elsevier Scopus (registration)
 - Academia (registration)
 - Sci-Hub (illegal)

https://scholar.google.com https://www.scopus.com https://www.academia.edu http://sci-hub. ...

- Query publishers directly For a specific journal or conference in computer science
 - IEEE Xplore
 - ACM Digital Library
 - Springer Link
 - Elsevier ScienceDirect

https://ieeexplore.ieee.org https://dl.acm.org https://link.springer.com https://www.sciencedirect.com





Investigating Found Publications

- Use appropriate reader
 - Permit highlighting, comments, and annotations
 - Xournal, Acrobat Reader, Foxit Reader, Mupdf, ...
- Use tool to manage your bibliography Organize, search, and annotate your BibTex entries
 - JabRef, BibDesk, EndNote, ...
- Use one tool for both
 - Manage, search, and comment both PDF documents and BibTex entry
 - Mendeley (freemium)
 - Zotero (freemium)
 - Citavi (freemium)

https://www.mendeley.com https://www.zotero.org https://www.citavi.com







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Common Tasks

- Create a classification scheme
 - Identify classifying criteria
 - Set up list, tree, or map of terms, features, requirements, or classes
- Classify papers and approaches
 - Indicate found criteria in papers
 - Maintain classification for each paper or approach
 - Produce diagrams for comparison tables, bubble charts, or kiviat graphs







For Papers

- Taxonomy of terms
- General classification of research papers by Shaw
- Orthogonal dimensions of classes

For Approaches

- List of (non-)functional requirements
- List of qualitative and quantitative properties
- Feature model consisting of features and dependencies



- Existence of general classification schemata, *e.g.*, Shaw's classification of research [Shaw2002]
- Utilize existing classifications from related **surveys** or **PhD theses**, *e.g.*, *Feature model for language workbenches* [*Erdweg et al.2015*]
- Creating new classification scheme
 - Start from existing schemata; extend missing dimension
 - Retrieve requirements, goals, or features from publications

Never use made up classification schemata







- After selecting relevant papers or approaches
- Investigate each paper annotate mentioned requirements and features
- Use tool support to track annotations for each paper or approach, e.g., **SLR-Toolkit**¹ uses BibTex annotation and supports arbitrary hierarchical classification schemes

1) https://github.com/sebastiangoetz/slr-toolkit





Classifying Research Showing Comparison Results



Qualitative Evaluation

- Comparison tables
 - *Terms, Icons* (○ ● ○)*,* ...
- Diagrams for detailed comparison
 - (2D) *Pie charts, Histograms, ...*
 - (3D) Bubble charts, 3D Plots, ...
 - (nD) *Kiviatgraphs, Parallel Hierarchies, ...*



Quantitative Evaluation

- Tables for basic analysis *Standard deviation (+/-), Mean, ...*
- Plots for more complex analyses

 (2D) Plots, Box plots, Line chart, ...
 (3D) Heat Maps, 3D Plots, ...
 (nD) Parallel Koordinates, ...







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Common Tasks

- Deploy the given **template**
- Read and understand author guidelines
- Add all **meta information** (*title, authors, affiliations, ...*)
- Include your **abstract**
- **Structure** your document into subdocuments per chapter/section
- Include images, listings, and tables in **floating environment**





Practical Paper Writin	١g
Preparing your Submissi	on

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<text><text><text><text><text><text><text></text></text></text></text></text></text></text>	successfully applied to develop families of	languages, ultimately	editor for each member of the language family. Curren	tly, most of 7	
 The second property is barried, the ordy and it is by the property is barried by the prop	establishing the field of Language Product L	ines (LPLs). Currently,	the LPL approaches address the development of familie languages, such as domain-specific languages (DSLs) :	and general	
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Comply to the Paper Geometry

- Fix **all** Overfull box errors³
 - Use a ruler or
 - \usepackage[color=red, width=3pt, height=0.5\baselineskip]{overcolored}
- Fix *some* Underfull box errors
- Check the boundaries of all images
- Set the correct geometry⁴
 - A4 \rightarrow a4paper
 - US Letter \rightarrow letterpaper
 - US Legal \rightarrow legalpaper
 - ...
 - \documentclass[a4paper]{acmart}
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- 3) https://github.com/raphink/overcolored
- 4) https://ctan.org/pkg/geometry





Practical Paper Writing Check Spelling and Grammar



- Check for spelling and grammar mistakes
 - Use a spell checker,⁵
 - Revise your own text, and
 - Employ a proofreader
- Check punctuation
 - Comma before accessory sentence with *because, which, ...*
 - No comma before *that*
 - Comma after therefore, nonetheless, in conclusion, ...
 - Use the oxford comma⁶

- 5) https://www.youtube.com/watch?v=8Gv0H-vPoDc
- 6) http://richardgilbert.me/we-like-the-oxford-comma-ii 42/53





Chicago Manual of Style (CMS) title capitalization rules^{7,8}

- 1. Capitalize first and last words in titles and subtitles (but cf. 7), and capitalize all other major words (nouns, pronouns, verbs, adjectives, adverbs, and some conjunctions—but see rule 4).
- 2. Lowercase the articles *the*, *a*, *and an*.
- 3. Lowercase prepositions, regardless of length, except when used adverbially or adjectivally (*up in Look Up, down in Turn Down, on in The On Button, to in Come To, etc.*) or when they compose part of a Latin expression used adjectivally or adverbially (*De Facto, In Vitro, etc.*).
- 4. Lowercase common coordinating conjunctions and, but, for, or, and nor.
- 5. Lowercase not only as a preposition (rule 3), but also as part of an infinitive (to Run, to Hide, etc.), and lowercase as in any grammatical function.
- 6. Lowercase the part of a proper name that would be lowercased in text, such as *de* or *von*.
- 7. Lowercase the second part of a species name, such as fulvescens in Acipenser fulvescens, even if it is the last word in a title or subtitle.
- 7) http://www.chicagomanualofstyle.org/book/ed17/part2/ch08/psec159.html
- 8) http://www.chicagomanualofstyle.org/book/ed17/part2/ch08/psec161.html





Practical Paper Writing Check Misused Words and False Friends

Usual alternative comparable complement dependent descendant discrete emit ensure ensure excerpt

Other alternate comparative compliment dependant descendent discreet omit insure assure exert

Usual foregoing further elusive manyfold omit partly principle simple solvable stationary

Other forgoing farther illusive manifold emit partially principal simplistic soluble stationery





Practical Paper Writing Check Typical Mistakes

Right adaptation apparent argument comparison consistent definite existence foreign grammar heterogeneous homogeneous independent insoluble

Wrong adaption apparant arguement comparision consistant definate existance foriegn grammer heterogenous homogenous independant insolvable

Right miniature occasional occurred participate primitive propagate pronunciation pseudo referred repository separate supersede transparent

ASiCS

Wrong minature occaisional occured particepate primative propogate pronounciation psuedo refered repositery seperate supercede transparant





- Include a non-breaking space before each citation modeling languages~\cite{authorE}
- Citations at end of a sentence

"conducted, as well. $[5]'' \rightarrow$ "conducted [5], as well."

"modeling languages. $[27]' \rightarrow$ "modeling languages [27]."

• Correctly list citations

"[1], [2], [3], [6]" should be "[1–2,6]"

\cite{authorA,authorB,authorC,authorF}





• Fix footnotes occurring before punctuations

"family of RMLs³." \rightarrow "family of RMLs.³"

"feature¹²," \rightarrow "feature,¹²"

"major drawback ¹²³" \rightarrow "major drawback^{1,2,3}"

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• Footnotes with links utilize \url{https://...}

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• Footnotes in paper title and authors with \titlenote and \authornote





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Ι		
Animal	Description	Price $(\$)$
Gnat	per gram	13.65
	each	0.01
Gnu	stuffed	92.50
Emu	stuffed	33.33
Armadillo	frozen	8.99





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Widow

 Last sentence of paragraph on new page

Orphan

• First sentence of paragraph on previous page

Orphan (alternative)

 Last word of paragraph alone on last line

9) https://en.wikipedia.org/wiki/Widows_and_orphans





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Software for Digital Health Scientific Writing





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