Intelligent Writing Assistance
... and beyond

Christian Stab

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Overview

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- Intelligent Writing Assistance
- Classifying Edit Categories in Wikipedia Revisions
- Argumentative Writing Support
- Multiple Document Summarization

Intelligent Writing Assistance

Overview

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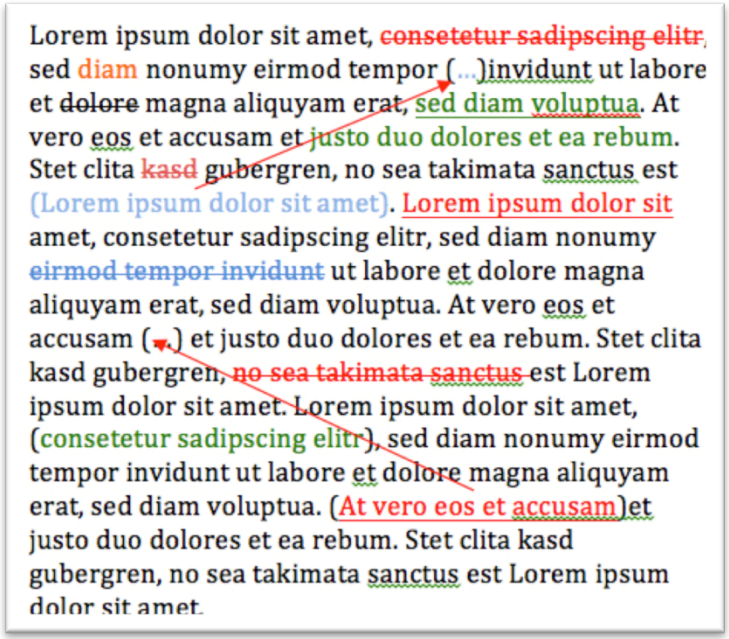
Interdisciplinary Research Field

- Psychology, Philosophy, Linguistics, Computer Science

Goals of Intelligent Writing Assitance

- **Feedback** about written text
- Improvement of **writing skills** and **text quality**
- Identification of **flaws** in written text
- Support different **writing tasks**



Existing approaches

- Spell-Checking, Grammar checking, ...

Future Writing Assistance might incorporate:

- Feedback about readability, Discourse Analysis, Feedback about content, ...

Intelligent Writing Assistance

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✗ ***IWA aims NOT to:***

- automatically grade texts
- replace teachers
- automatically correct text

✔ ***IWA covers***:

- Improvement of the writing process
- Assistance during writing
- Improvement of learning curve
- Providing individual guidance of learners

Intelligent Writing Assistance

Challenges

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Analysis of the writing process

- What are common patterns/styles of writing?
- In which way do authors revise text?

Support different writing tasks

- Handling of multiple documents (summarization)
- Argumentative writing

Assessment of text quality on different levels

- Which criteria are appropriate for assessing text quality?
- How to assess the content of texts?
- How to automatically judge the credibility or readability?

Provide Feedback

- When to provide feedback?
- Which levels are appropriate?

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Classifying Edit Categories in Wikipedia Revisions

Johannes Daxenberger and Iryna Gurevych
(daxenberger@ukp.informatilk.tu-darmstadt.de)

Daxenberger J, Gurevych I (2013) Automatically Classifying Edit Categories in Wikipedia Revisions. Proceedings of EMNLP, pp. 578-589

Analysis of the collaborative writing process

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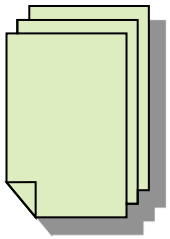
Analyzing user collaboration

- Identify types of changes
- Analysis of collaborative writing patterns



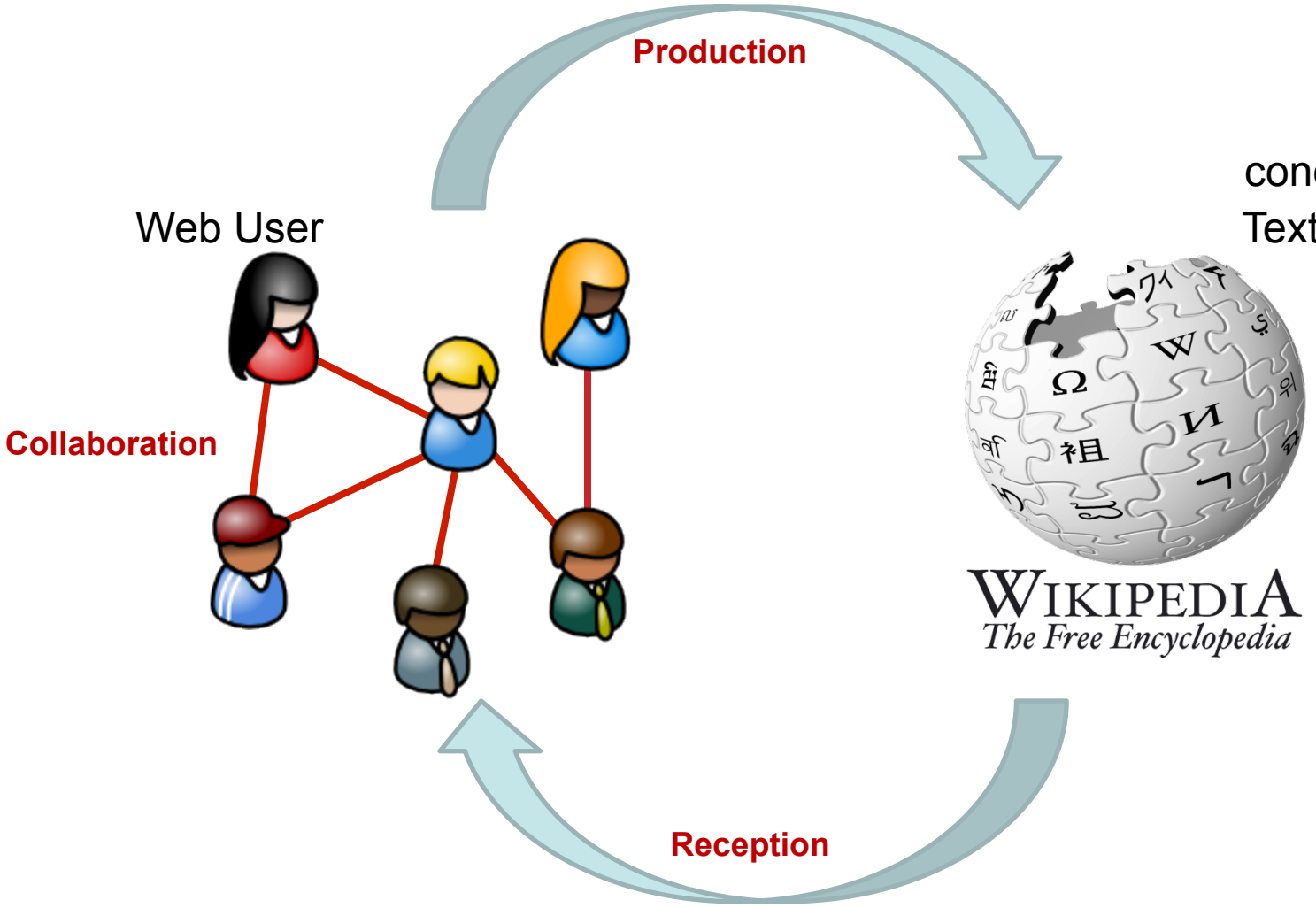
Article Revision History

- Changes of articles from different authors
- Tracking of individual edits

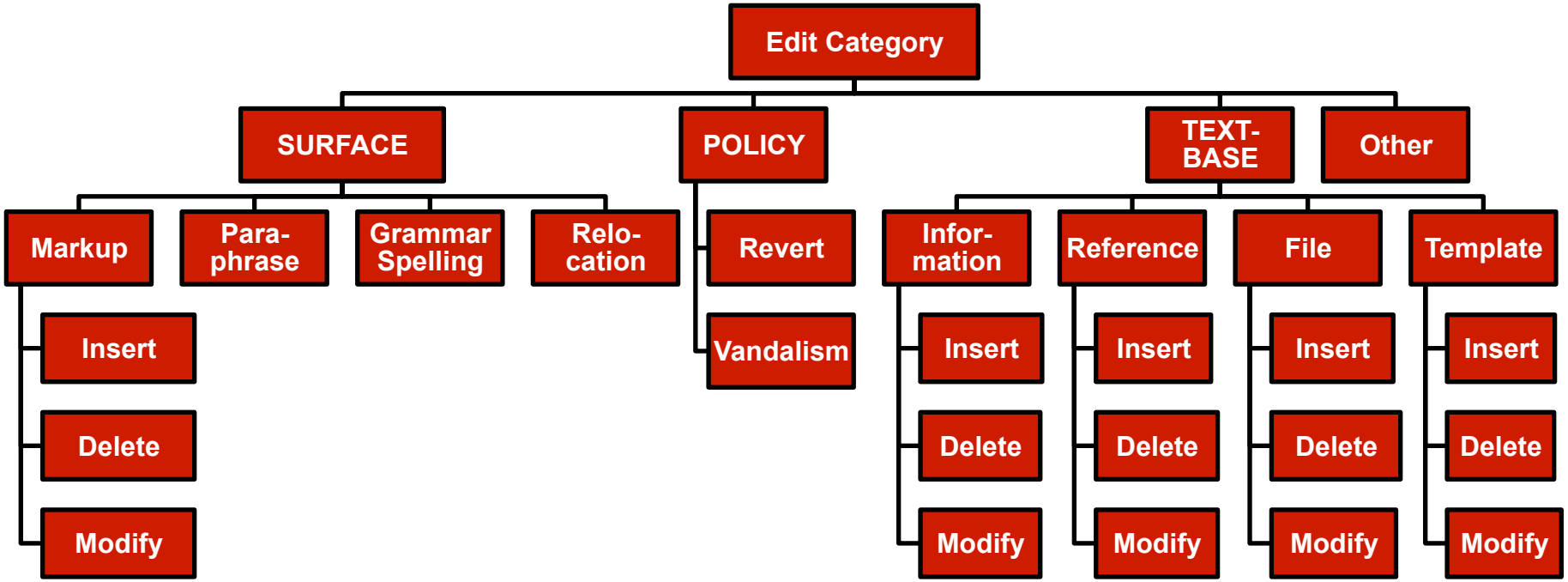
Goal: Automatic classification of edits

- Predict types of edits
- Are there correlations between revision acts and text quality?

User Collaboration in Wikipedia



Wikipedia Edit Category Taxonomy



Edit Categories: Examples

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- INFORMATION-INSERT, MARKUP-INSERT

	==In popular media==

- VANDALIZE

Einstein's key insight was	Einstein's cheese master insight was

- GRAMMAR/SPELLING

in the Ireland	in Ireland

Annotation Study

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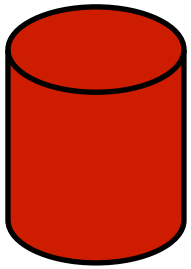
- Expert Annotators
- Multi-labeling: each edit is labeled with a set of categories $Y \subset L$, where L is the set of all edit categories, $|L|=21$, $1 \leq |Y| \leq 21$
- Data reliability (inter-annotator agreement):
  - Krippendorf's α = 0.67 [English] – 0.75 [German]

English
1,995 Edits
891 Revisions
3 Annotators



German
1,326 Edits
813 Revisions
2 Annotators

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Edit Category Distribution

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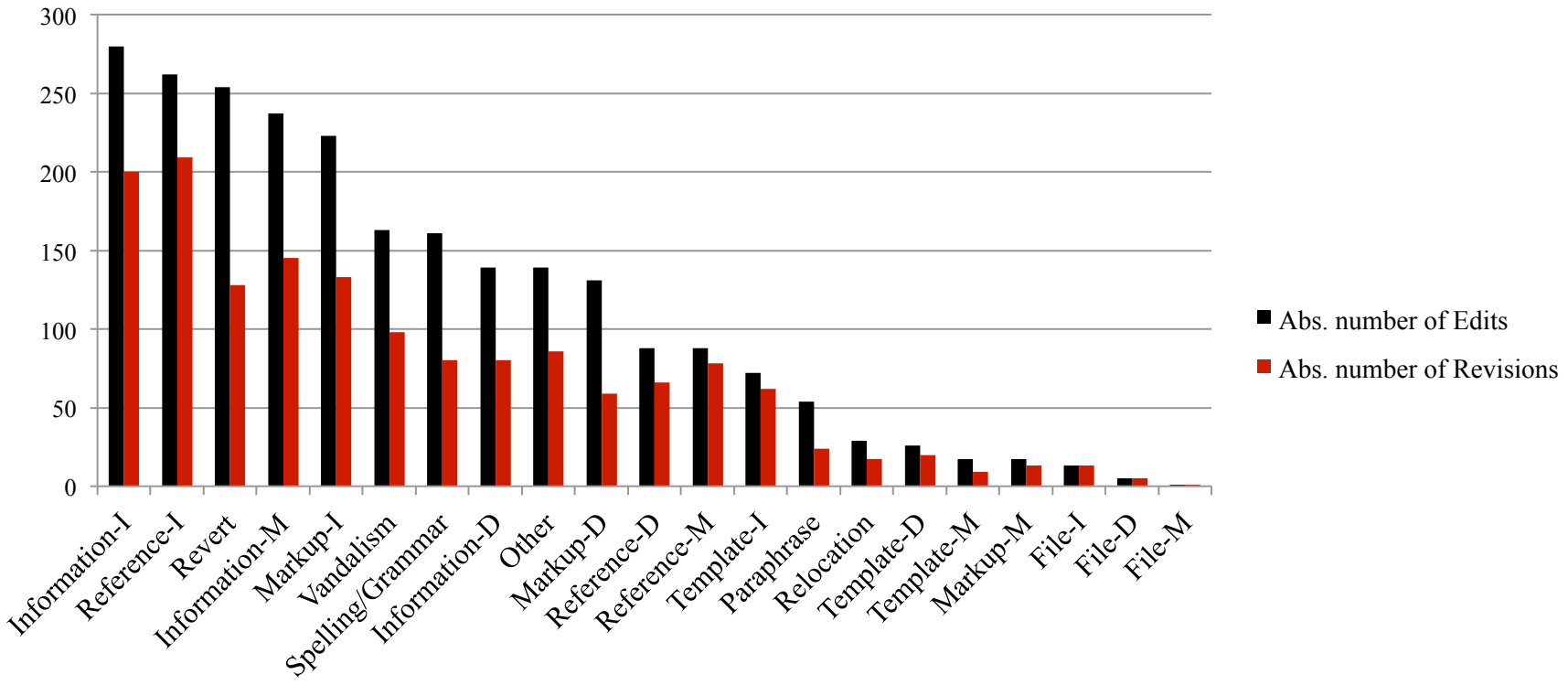
Number of Edits/Revisions which have been labeled with a certain category



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Automatic Classification of Edit Categories: Features

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Meta data Features

Author group, Comment length, Comment n-grams, Is Revert…

Textual Features

Character n-grams, Cosine similarity, Difference in the number of capital letters/digits/tokens, …

Markup Features

Difference in the number & type of templates/links/images, …

Language Features

Difference in the number of spelling errors, semantic similarity, difference in number & type of POS tags

Automatic Classification of Edit Categories: English Data Set

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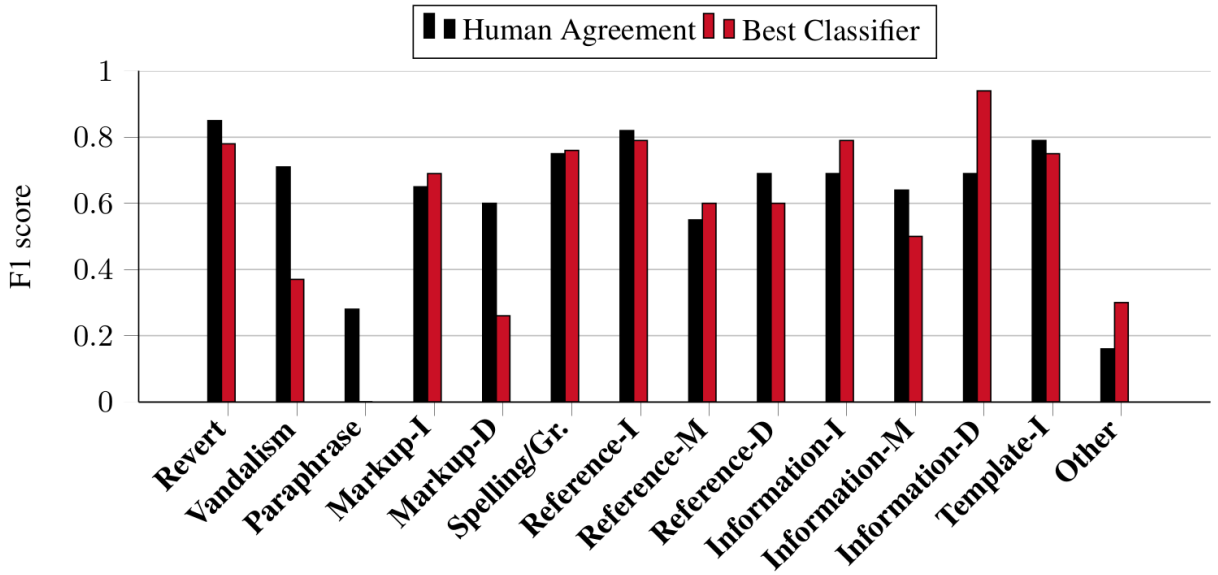
	Baseline (Random)	Best Classifier
Accuracy	0.08	0.59
Exact Match	0.05	0.50
Micro-F1	0.11	0.66
Macro-F1	0.08	0.59
One Error	0.89	0.31



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Automatic Classification of Edit Categories: Which Features are Important?

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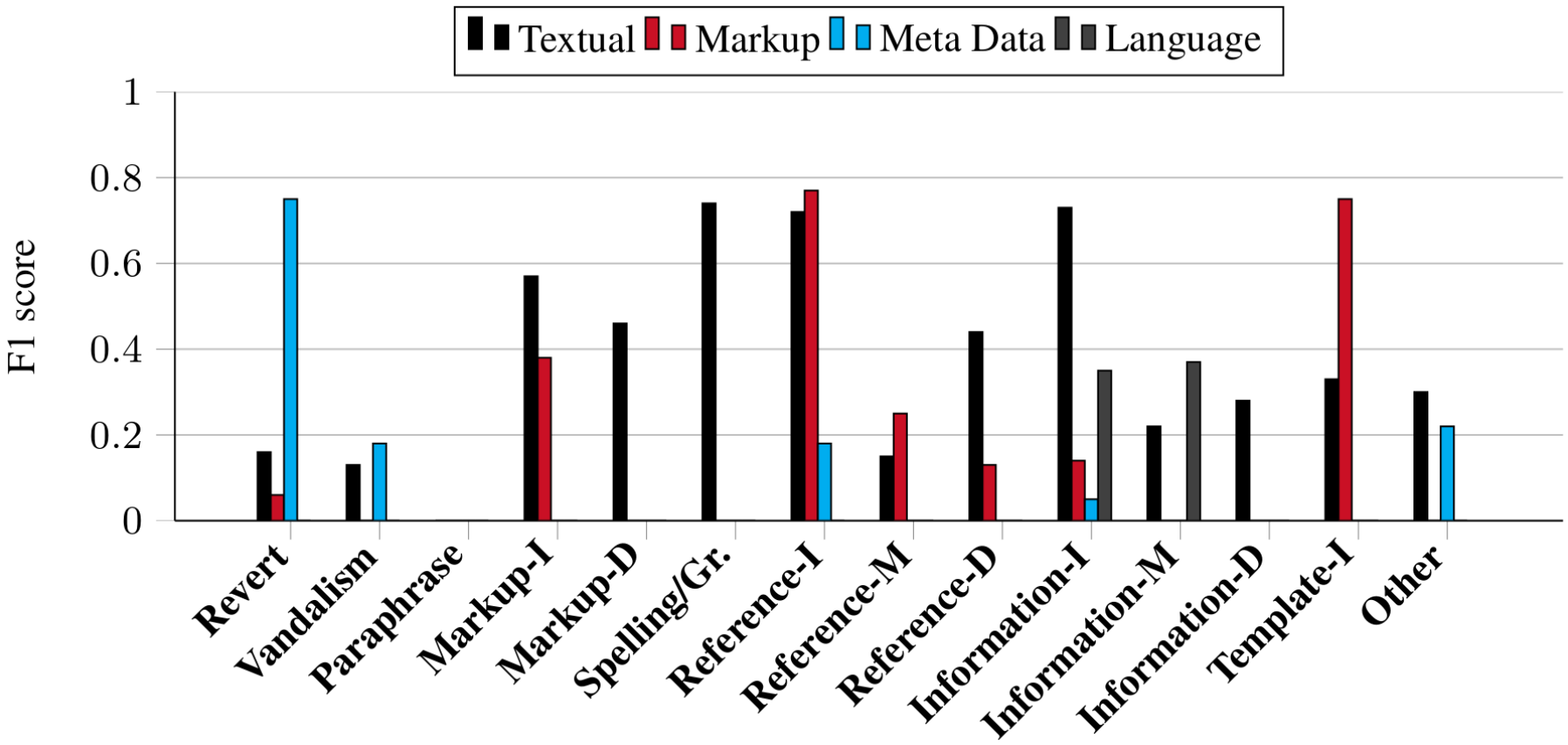

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Conclusion & next steps

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Corpus containing annotated revisions[1]

- Available for download at http://www.ukp.tu-darmstadt.de/data/textual-revisions/
- Including annotation guideline

DKPro-TC (Text Classification Framework)

- Is available for free at https://code.google.com/p/dkpro-tc/
- Is applicable for several text classification
- Contains numerous features extractors

Future Work

- Recent findings indicate a correlations between article development and quality
- Can revisions be used to support authors regarding text quality?

[1] Johannes Daxenberger and Iryna Gurevych: A Corpus-Based Study of Edit Categories in Featured and Non-Featured Wikipedia Articles. Proceedings of the 24th International Conference on Computational Linguistics (COLING 2012), pp. 711-726, December 2012. Mumbai, India

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Argumentative Writing Support

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Argumentative Writing Support
Motivation

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- Writing well-structured arguments is a complex task
  - Argument structure has to be easily comprehensible
  - Components of an argument should be traceable
  - Arguments should be well connected with the context and the “message” of the text
  - …
- “Students are usually underprepared in writing well-structured arguments”[1]
  - NAEP persuasive writing assessment (2007)
- Argumentative Writing Support (AWS) is a particular type of IWA
  - provides feedback about written argumentation
  - aims at improving argumentation skills of authors/writers
  - improves argument comprehension (for the reader) and argumentation structures in written text

[1] Butler, J. A., & Britt, M. A. (2011). Investigating Instruction for Improving Revision of Argumentative Essays. Written Communication, 28(1), 70–96. doi: 10.1177/0741088310387891

Argumentative Writing Support
Motivation

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Recent findings in psychology emphasize the need of AWS

- Argumentation tutorials significantly improve the argumentation style[1]
  - Authors are more precise in presenting the claim after receiving argument tutorials
  - Performance in providing support (for arguments) is increased
- Global text revisions as a strategy for improving argumentation style[2]
  - Expert writers make more global revisions resulting in well-structured argumentation schemes
  - Revision and argumentation tutorials lead to more global revisions and better argumentation style
- Order of argumentation components influences reading and recall performance[3]
  - Arguments can be read faster when the claim precedes the reason
  - Claims where recalled better than reasons
  - Claim-first arguments where recalled more accurately than reason-first arguments
  - Readers identify claims by the presence of markers (cue phrases, e.g. qualifiers or modals)
  - Marked arguments are read faster and recalled more accurately in claim-first arguments

[1] Wolfe, C. R., Britt, M. A., & Butler, J. A. (2009). Argumentation Schema and the Myside Bias in Written Argumentation. Written Communication, 26 (2), 183–209. doi : 10.1177/0741088309333019

[2] Butler, J. A., & Britt, M. A. (2011). Investigating Instruction for Improving Revision of Argumentative Essays. Written Communication, 28(1), 70–96. doi:10.1177/0741088310387891

[3] Britt, A. M., & Larson, A. A. (2003). Constructing representations of arguments. Journal of Memory and Language, 48(4), 794–810. doi:10.1016/S0749-596X(03)00002-0

Argumentative Writing Support
Vision

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Argumentative Writing Support

Feedback about argumentation

Argumentative Support Systems

- Support users create, and manipulate arguments
- Manual argument diagramming
- Support for argument improvement e.g. by recommending missing structures

Argument Extraction / Mining

- Identifying argumentative components in written text by means of NLP
- Automatic Identification
- Deriving the structure between argument components

Argumentative Writing Support
Argument Structures

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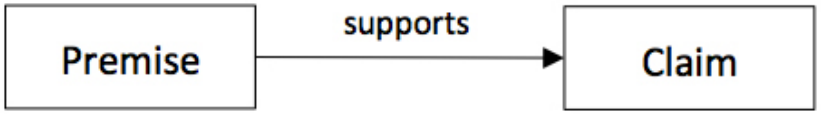
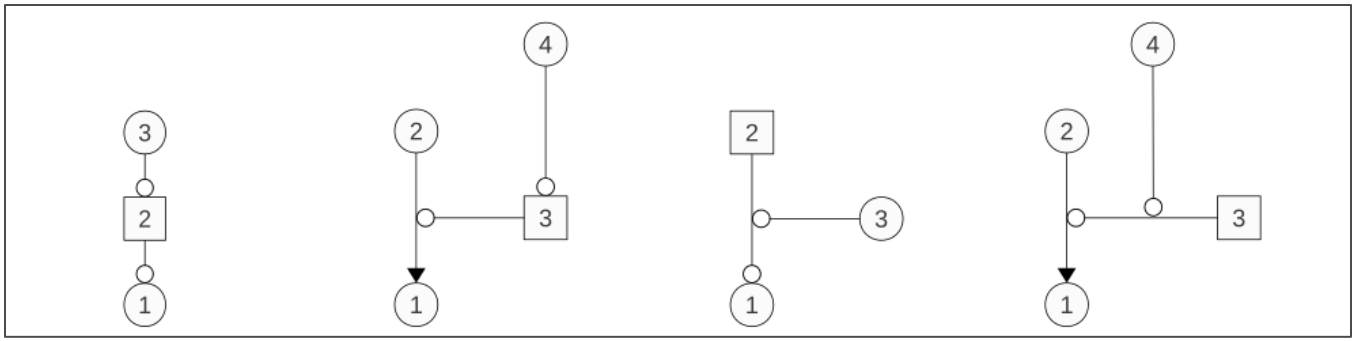
- Arguments includes one ***claim*** that is at least supported by one ***premise***



- But the structures are usually more complex:



from Peldzsus & Stede 2013

Peldszus, A., & Stede, M. (2013). From Argument Diagrams to Argumentation Mining in Texts: A Survey. International Journal of Cognitive Informatics and Natural Intelligence (IJCINI), 7(1), 1–31. doi:10.4018/jcini.2013010101

Argumentative Writing Support
Next steps and challenges

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Create an annotated corpus based on essays

- Annotation guidelines & schemes

Investigate NLP-Methods for identifying components and structures

- How to identify argumentative segments in text?
- What about discourse analysis or RST?
- Which feature sets are appropriate for different argumentative aspects?

Find out which feedback type is appropriate

- Identify types of feedback by means of the findings from psychology.
- Is structural feedback enough?

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Multi Document Summarization

Margot Mieskes
(mieskes@dipf.de)

Margot Mieskes, Christoph Müller, and Michael Strube (2007). Improving extractive dialogue summarization by utilizing human feedback. In Proceedings of the IASTED Artificial Intelligence and Applications Conference, Innsbruck, Austria, 11-14 February 2007.

Multiple Document Summarization
Overview

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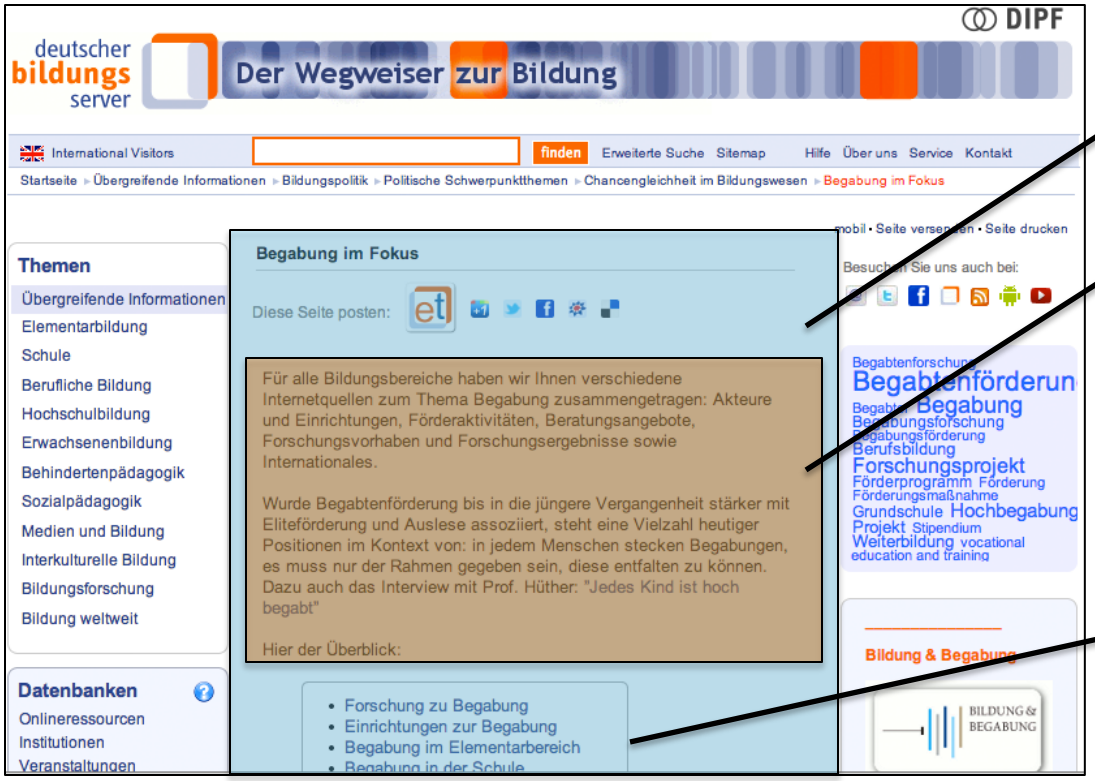
- ***Deutscher Bildungsserver*** (http://www.bildungsserver.de/)
  - Collection dossier- and theme pages, containing short descriptions



Dossier page

Short description

Links to source documents

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Multiple Document Summarization

Overview

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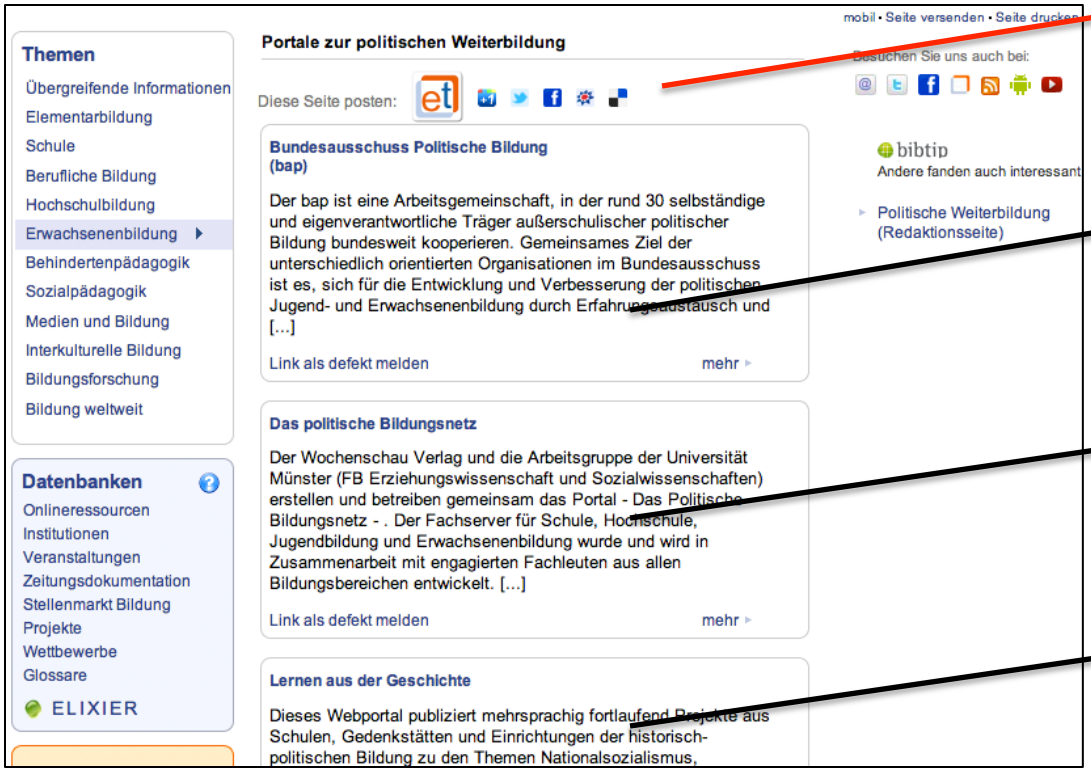
For about 5000 pages the description is missing

?

Short description



Links to source documents

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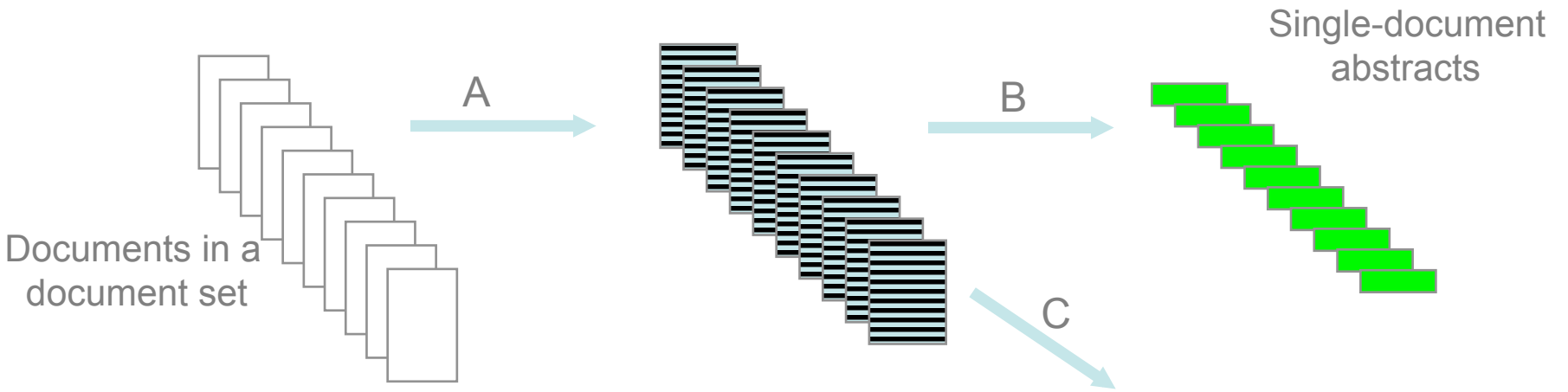
Multiple Document Summarization
Creation of corpora



A: **Read hardcopy of documents.**

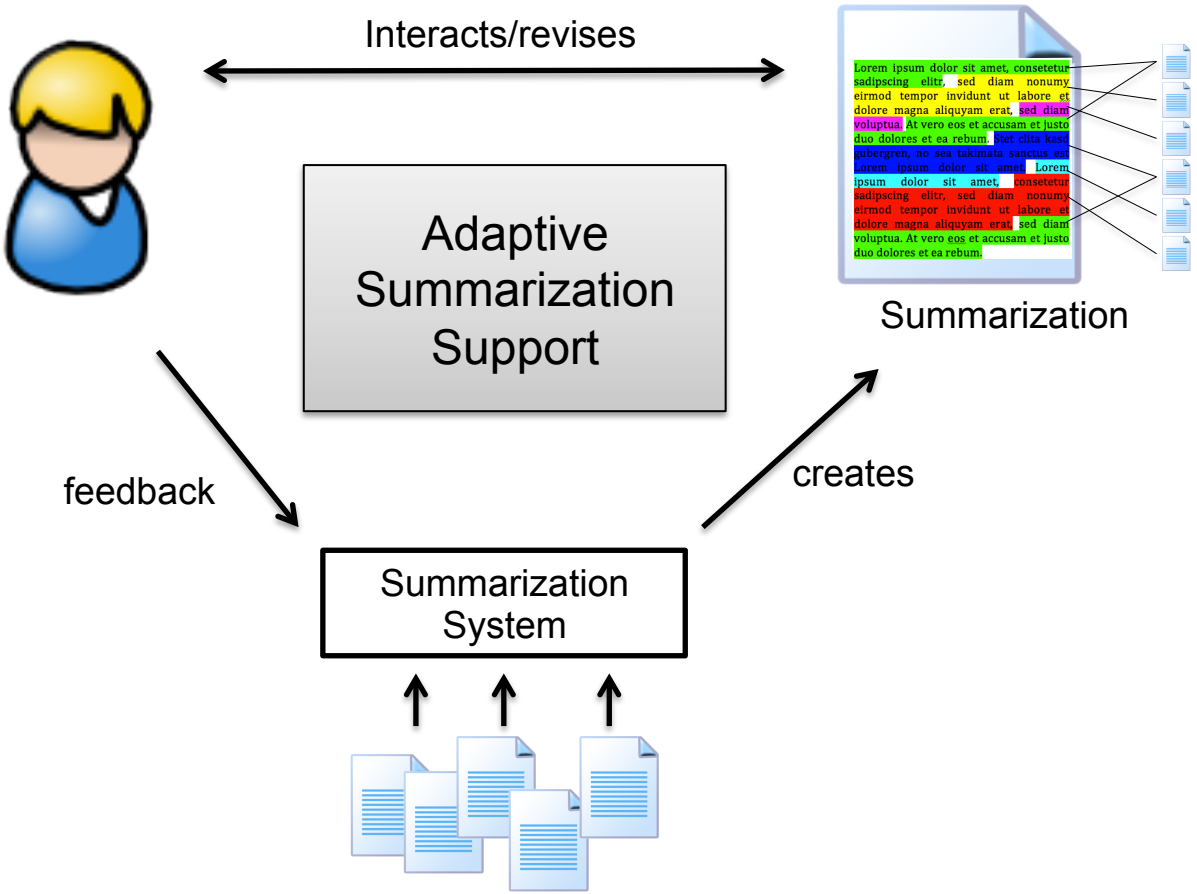
B: **Create a 100-word softcopy abstract for each document using the document author's perspective.**

C: **Create a 200-word softcopy multi-document abstract of all 10 documents together written as a report for a contemporary adult newspaper reader.**

D,E,F: **Cut, paste, and reformulate to reduce the size of the abstract by half.**

Multiple Document Summarization

Intelligent Writing Assistance



Multiple Document Summarization
Challenges

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How to learn from user interactions in summarization tasks?

- Which information can be used to improve summarization methods?
- How to integrate them in a summarization system

Which information should be provided to the user?

- Summarization of single documents and leave the integration to the user?
- or complete summarization for revision?

Summary

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Overview of UKP's current research in the area of IWA

Analysis of the writing process

Argumentative Writing Support

Support for Multiple Document Summarization

Challenges in Intelligent Writing Assistance

- Quality assessment of text during the writing process
- User feedback
- Tailored methods with respect to the user

Questions…

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Thanks for your attention!

Questions?