Computational Narratology: Extracting Tense Clusters from Narrative Texts

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Context of this Work

Computational Narratology

- context: Digital Humanities
- facilitate annotations from literary scientists
- support hypotheses [1]
- methods: Natural Language Processing

Temporal phenomena

- field of study in narratology
- temporal structure of literary texts
- examples: time shifts, order phenomena (e.g., prolepsis)

The heureCLÉA Project [4]

Cooperation

- BMBF-funded eHumanities project
- narratologists (Hamburg)
- computer scientists (Heidelberg)
- temporal phenomena in literary text

Goals

- collaborative annotation framework that automatically suggests annotations
- reduce effort of manual annotations
- analysis of temporal aspects in narrative texts

Temporal Phenomena in Literary Texts

Temporal expressions

- explicit temporal information
- can be extracted automatically (HeidelTime [2])
- less frequent in literary text

Tense information

- tenses: information about temporal structures
- shifts in tenses indicate order phenomena (e.g., prolepsis)

Prior work

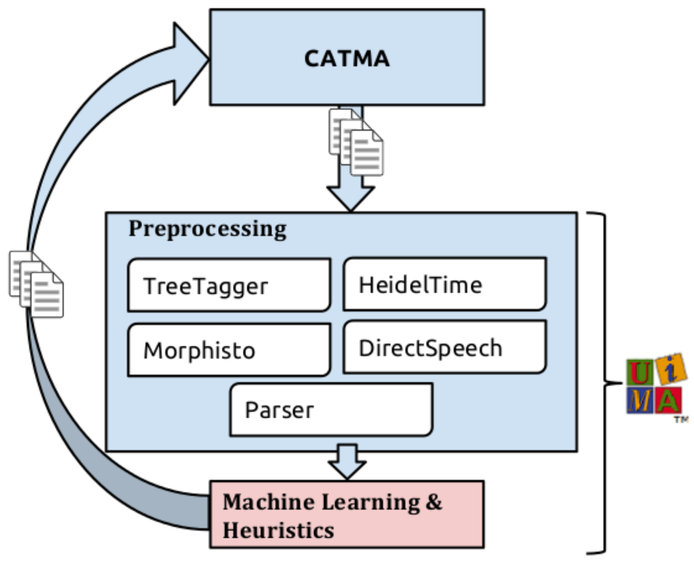
- laborious manual annotations
- automatic systems focus on English
- no existing system for German tense annotation

Data set

- German narrative texts (20^{th} century)
- annotations by literary scientists
- tagset: narratological aspects

Task: robust annotation of tenses in narrative texts

NLP Pipeline Architecture [3]



Component Description and Tools

NLP components

- POS tagging: TreeTagger
- morphology: Morphisto
- time expressions: HeidelTime
- syntactic parsing: Parzu & Stanford parser

CATMA interface

- CATMA: collaborative annotation platform
- flexible CATMA $\leftrightarrow$ UIMA interface
- tailored to narratologists

Machine learning interface

- feature extraction and machine learning
- interchangeable algorithms
- goal: predict annotations automatically

Feedback loop on predicted annotations

- manual corrections
- improvement of future predictions (ML)

Use Case: Tense Annotations

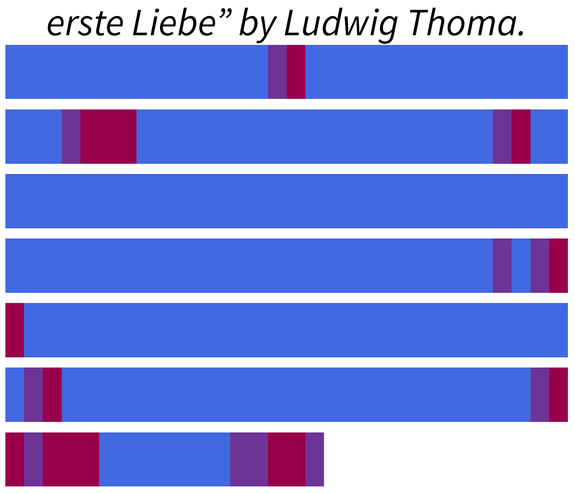
Extracting temporal clusters

- temporal cluster: all tokens governed by the same verb
- exploitation of tense markers (e.g., auxiliaries)
- morphological features & heuristics
- heuristic for sentences with unknown tense
- evaluation: comparison to manual annotations
- high inter-annotator agreement ($\kappa > 0.8$)

Ongoing work

- machine learning based system for additional annotations, e.g., narrative levels
- hybrid, self-improving system: heuristics + machine learning

Visualization of temporal clusters in "Meine erste Liebe" by Ludwig Thoma.



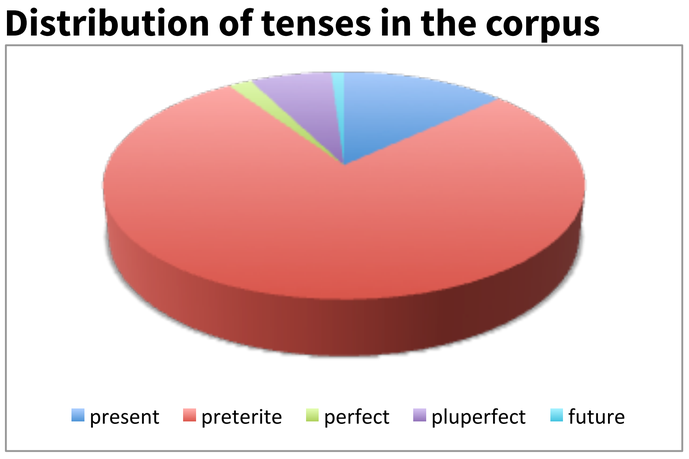
- each block: temporal cluster
- colors correspond to tenses
  - *blue*: preterite
  - *red*: future
  - *purple*: present
- text mostly written in preterite, interrupted by forecasts.

Evaluation Results

tense	correctly tagged verbs
present	93.10
preterite	95.73
perfect	96.43
pluperfect	84.71
future	90.00

$\Rightarrow$ reliable and robust prediction of tense clusters

Distribution of tenses in the corpus



References

[1] I. Mani: Computational Narratology. **The living handbook of narratology**. http://www.lhn.uni-hamburg.de/article/computational-narratology, 2013.

[2] J. Strötgen and M. Gertz: **Multilingual and Cross-domain Temporal Tagging.** *Language Resources and Evaluation*, 47(2), 269–298, 2014.

[3] T. Bögel, J. Strötgen, C. Mayer and M. Gertz: **A Flexible NLP Pipeline for Computational Narratology.** *1. Jahrestagung der Digital Humanities im deutschsprachigen Raum (DHd)*, 2014.

[4] The heureCLÉA Project: http://www.heureclea.de/.

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