Pattern Recognition Lab

FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG

FACULTY OF ENGINEERING

Handwritten Text Recognition Error Rate Reduction in Historical Documents using Naive Transcribers

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Introduction

- **Goal:** HTR error rate reduction for large-scale transcription
- **Assumptions:**
  - Robust HTR model not available (complex script, missing training data, etc.)
  - Historical experts too expensive
- **Idea:** use naive transcribers and fuse outputs with HTR output

Dataset

- Pages from the first volume of *Nuremberg letters of correspondence*
- 100 pages to train the HTR system
- 10 independent pages for testing

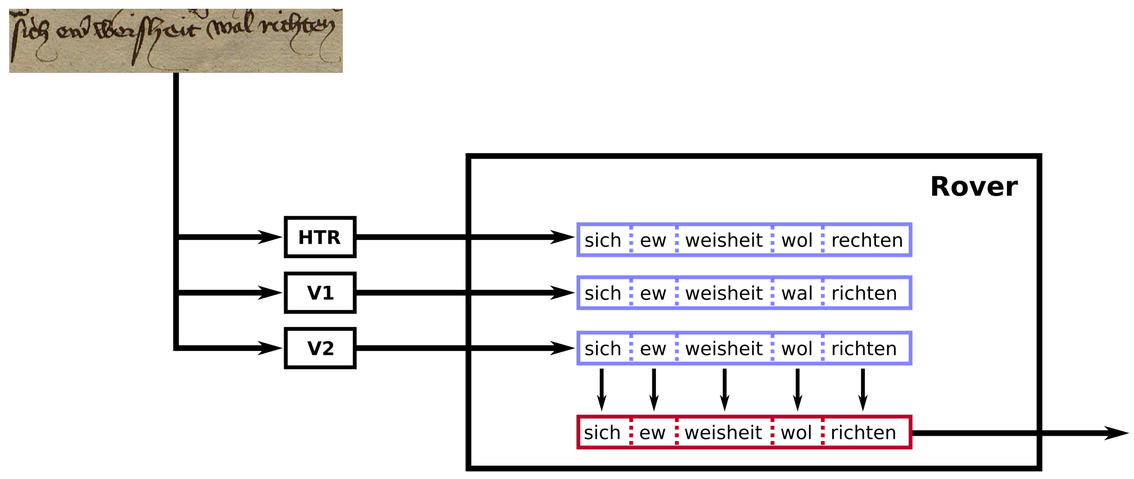
Quantitative Results

System	Average Page WER (std. dev.)	Overall WER
HTR	23.1 (±7.0)	24.6
V1	24.9 (±4.7)	25.7
V2	26.4 (±4.3)	27.1
Rover	**18.2** (±5.0)	**19.2**

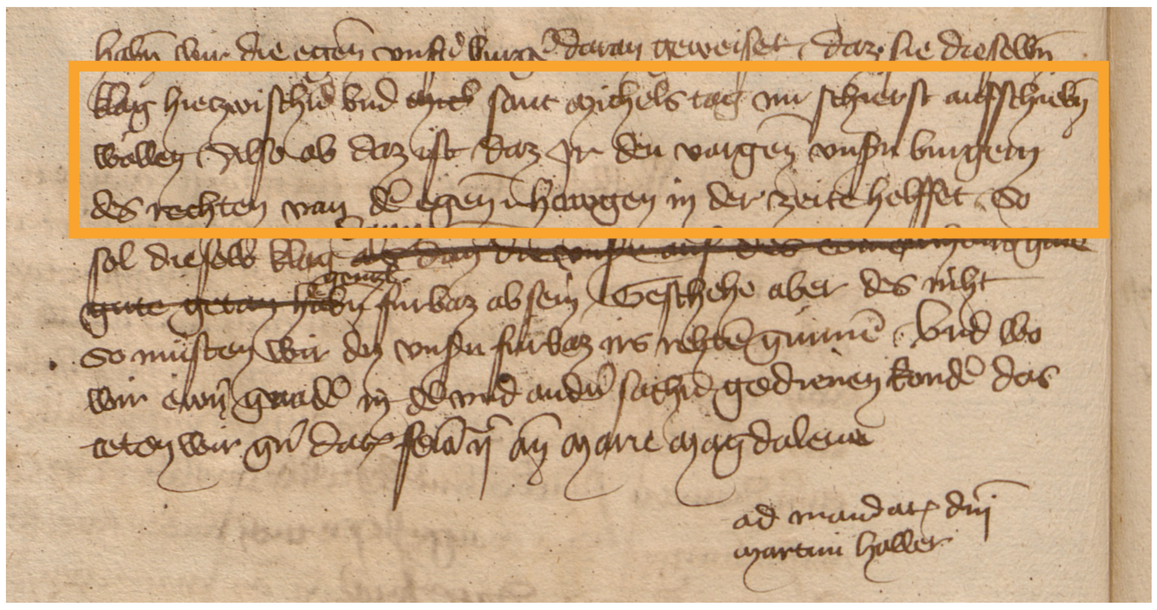
Methodology

- **Input:**
  - HTR of Transcribus: state-of-the-art deep-learning-based HTR system [1, 2]
  - Naive transcriptions created by the Digi-Texx company
- **Word-level fusion by ROVER:**
  - HTR system as reference chain
  - Line-based alignment of naive transcriptions (V1, V2) using dynamic programming
  - Word-level majority voting
  - In case of no clear majority: HTR output

Outline



Qualitative Results



GT	klag hie czischn und mich sant Michels tag nu schierst aufschiebn
HTR	klag hieczwischn und und sant Michels tag zu schierst aufschiebn
V1	klag hieczwischn und wies sant wichels tag am schierst aufschriebn
V2	klag hiezwischn und wie sant michels tan nu schierst ausschribn
ROVER	klag hieczwischn und und sant Michels tag zu schierst aufschiebn
GT	wöllen Also ob daz ist daz Ir den vorgen vnsn burgern
HTR	wölle Also ob daz ist daz Ir den vorgen vnsn burgerin
V1	wöllen Also ob daz ist daz Ir den vorgen vnsn burgem
V2	wöllen Also ab daz ist daz Ir den vorgen vnsn burgen
ROVER	wöllen Also ob daz ist daz Ir den vorgen vnsn burgerin
GT	des rechten von de egen hawgen in der zeite helffet So
HTR	des rechten von de egen hawgen in der zeite helffer So
V1	des rechten van de egen uhawgen in der zeite helffet So
V2	des rechten von de egen uhawgen in der zeite helffet So
ROVER	des rechten von de egen uhawgen in der zeite helffet So

Summary

- Combining HTR output with naive transcriptions
- Evaluation on a difficult test set with rather bad HTR performance

⇒ Successful HTR error rate reduction by about 5 %

Outlook

- Advanced alignment/voting mechanism
- Effect of more naive transcribers
- Compute pseudo confidences for naive transcriptions

References

[1] G. Leifert, T. Strauß, T. Grüning, and R. Labahn, "CITlab ARGUS for historical handwritten documents," 2016.

[2] T. Strauß, M. Weidemann, J. Michael, G. Leifert, T. Grüning, and R. Labahn, "System Description of CITlab's Recognition & Retrieval Engine for ICDAR2017 Competition on Information Extraction in Historical Handwritten Records," 2018.

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