

Cross-Lingual Constituency Parsing for Middle High German: A Delexicalized Approach

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- 1 Introduction
- 2 Delexicalization Parsing for Middle High German
- 3 Experimental Setup and Results
- 4 Conclusion

- **Syntactically annotated corpora of historical languages**
 - form the foundation for **linguistic analysis** (language change, contact and variation, linguistic evolution of morphology, syntax, etc.).
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→ **Solution:** Training an automatic syntactic analysis system using cross-lingual transfer techniques.

● POS-Tagged Corpora

- German Reference Corpus¹



¹ <https://www.deutschdiachrondigital.de/>

² <https://korpling.german.hu-berlin.de/ddb-doku/index.htm>

³ <https://ipchg.iu.edu/index.html>

⁴ <https://www.chlg.ugent.be/>

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● Parsed Corpora

Id.	Name	Languages	Style	Size
DDB ²	German Diachronic Treebank	OHG, MHG, ENHG	Tiger	8,580
IPCHG ³	Indiana Parsed Corpus of Historical (High) German	OHG, MHG, ENHG	PTB	~10,000
CHLG ⁴	Corpus of Historical Low German	MLG, OLG	PTB	~200,000

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- a historical stage of the German language that was spoken between 1050 and 1350.
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Motivation of the Delexicalization Method:

- The continuity in the process of language evolution gives rise to **linguistic similarities** between **MG** and **MHG**.
 - Similar sentence structure
 - Similar word order
- **Rich resources of MG** texts with syntactic annotations.
 - Tiger Corpus (Smith, 2003)

The delexicalization parsing system for MHG comprises three modules:

- **POS Tagger**

- Annotates a sequence of MHG tokens with POS and morphological tags.
- Trained on the ReM corpus using RNNTagger (Schmid, 2019).

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- **Delexicalized Parser**

- Based on the Berkeley Neural Parser (Benepar) (Kitaev and Klein, 2018)
- Trained on the Tiger Treebank (50,474 MG parse trees)

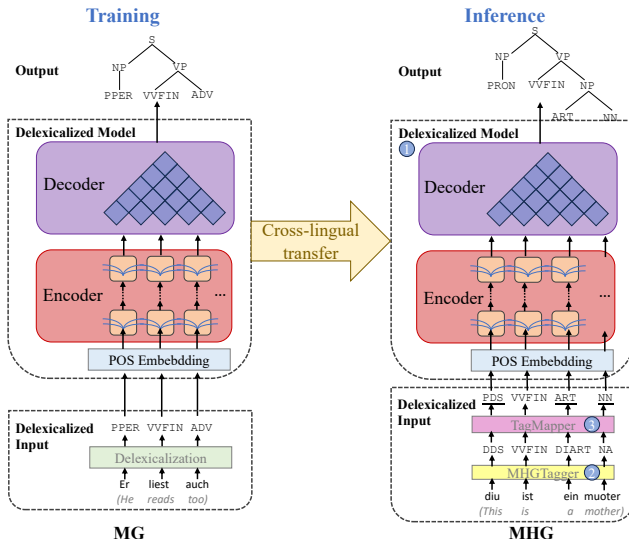


Figure: Overview of the cross-lingual delexicalized parsing system for MHG

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- **Vanilla Benepar:** performing a vanilla zero-shot cross-lingual transfer, training a Benepar model directly on MG treebanks without the delexicalization.
- **Tetra-Tagging with PLMs:** a technique reducing constituency parsing to sequence labeling (Kitaev and Klein, 2020)
 - **gBERT:** Tetra-Tagging with the German BERT model (Chan et al., 2020)
 - **mBERT:** Tetra-Tagging with the multilingual BERT model (Devlin et al., 2019)

	Recall		Precision		FScore		CM	
	MG	MHG	MG	MHG	MG	MHG	MG	MHG
<i>Baselines</i>								
Vanilla Benepar	84.18	34.41	87.57	44.40	85.84	38.77	45.80	0.00
Tetra-gBERT	86.31	23.20	88.19	29.53	87.24	25.98	51.70	3.12
Tetra-mBERT	60.68	19.69	65.61	23.25	63.15	21.32	21.35	0.00
<i>Our proposed method</i>								
Dexparser	81.39	64.72	84.89	70.19	83.10	67.34	39.03	12.50

Table: Parsing performance of different cross-lingual transfer methods. **CM** refers to “complete match” The best value of each column is indicated in **bold**.

- Dexparser demonstrates substantial advantages in parsing MHG compared to other baselines.
- Dexparser also achieves comparable results on MG.

	Recall	Precision	FScore	CM
Delexicalized parser using gold tags	66.18	71.17	68.59	14.58
- <i>using predicted tags</i>	64.72	70.19	67.34	12.50
- <i>without mapping</i>	59.16	68.82	63.63	7.29
- <i>without morphological information</i>	48.66	65.38	55.8	9.28

Table: The MHG parsing results with delexicalized parser in the ablation study.

- **Quality of POS annotation, tag set mapping and annotation of morphological information** collectively contribute to the performance of the delexicalization parser on MHG.

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- ① We present an effective cross-lingual constituency parsing approach by using the delexicalization.
- ② We utilize the linguistic similarities between MHG and Modern German (MG) to develop an automatic syntactic annotation system for Middle High German (MHG) based on the rich treebank resources of MG.
- ③ Our work provides a solution for the parsing of historical and ancient languages facing similar situations:
 - a. having relevant (modern) languages with rich treebank resources,
 - b. having rich POS-tagged text data.

Thanks for your attention!

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