Extending and Exploiting the Entity Graph for Analysis, Classification and Visualization of German Texts

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In a Nutshell

- Enhancing the entity graph
- Visualizing and analysing German texts using the entity graph
- Text classification with entity graph metrics

Entity Grid

Barzilay and Lapata (2008)

s_1 A little mouse sits in *his* hole. s_2 Although he has spotted some cheese just outside the hole, he doesn't dare to go get it. s_3 What if the *neighbor's* cat is around? s_4 *His* body shivers at the thought of the furry *predator*. s_5 Then, the mouse hears a barking sound close by. s_6 It could only come from the huge dog that sometimes chases the cat around. s_7 Confidently, the mouse crawls out of the hole - and *is promptly caught and eaten by the cat*. s_8 "It's good to be bilingual", purrs the cat.

Adjustments to syntactic role categories:

- ✓ Category for possession modifiers
- ✓ Weight reduction for embedded entities

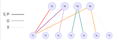
Weights

S/P = 3
O = 2
X = 1

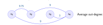
	MOUSE	HOLE	CHEESE	NEIGHBOR	CAT	BODY	THOUGHT	SOUND	DOG
s_1	S	X	–	–	–	–	–	–	–
s_2	S	X/	O	–	–	–	–	–	–
s_3	–	–	–	P	S	–	–	–	–
s_4	P	–	–	–	X	S	X	–	–
s_5	S	–	–	–	–	–	–	O	–
s_6	–	–	–	–	O/	–	–	S	S/
s_7	S	X	–	–	S	–	–	–	–
s_8	–	–	–	–	S	–	–	–	–

Entity Graph

Guinaudeau und Strube (2013)



One-mode projections (P_U and P_W) capture the relations between sentences:



Average out-degree is suitable measure for local coherence

Improvements with Adjusted Syntactic Categories

Evaluation by sentence reordering task on TüBa-D/Z news corpus

Original Entity Graph

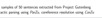
	Disc. acc.	Pos. ins.	Ins. acc.
P_U	0.881	0.124	0.102
P_W	0.880	0.142	0.114

Adjusted Entity Graph

	Disc. acc.	Pos. ins.	Ins. acc.
P_U	0.889*	0.132*	0.105*
P_W	**0.900***	**0.156***	**0.119***

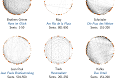
Text Analysis by Graph Metrics

- Visualization of entity graphs reveals differences in entity distribution among different authors and text types
- Graph metrics as features for analysis and classification



- Text samples of 50 sentences extracted from Project Gutenberg
- Syntactic parsing using *ParZu*, coreference resolution using *CorZu*

Entity Graph Examples for German Literary Texts



Brothers Grimm
Hans im Glück
Sents. 1-50

May
Am Rio de la Plata
Sents. 801-850

Schnitzler
Die Frau des Weisen
Sents. 151-200

Jean Paul
Jean Pauls Briefsammlung
Sents. 501-550

Tieck
Hexensabbat
Sents. 201-250

Kafka
Das Urteil
Sents. 151-200

Author and Genre Classification

- Support Vector Classifiers
- 24 features extracted from entity graph: *centrality measures, edge weights, diameter, maximum flow, edge betweenness, clustering coefficient, etc.*
- Comparison to 31 syntactic features

Does adding entity graph features improve the syntactic feature system?

Author Classification

	Acc.	F
EG P_W	0.470	0.298
Syntactic	0.740	0.731
+ EG P_W	**0.787***	**0.772***

Genre Classification

	Acc.	F
EG P_W	0.416	0.298
Syntactic	0.572	0.541
+ EG P_W	**0.615**	**0.560**

→ Entity graph features capture information not encoded in syntactic ones

Conclusion

- Possession modifiers category and reduced weights improve entity graph
- Entity graph visualization and graph metrics are suitable for analyzing texts
- Contribution of new information to author classification

Acknowledgements

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