Anatomy of OntoGUM---Adapting GUM to the OntoNotes Scheme to Evaluate Robustness of SOTA Coreference Algorithms

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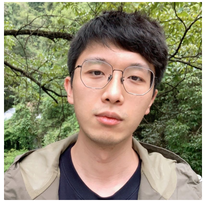  

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The Coreference Resolution Task

*"**I** voted for **Mary** because **Mary** was most aligned with **my** values", **John** said.*

Problems of Existing Coreference Datasets

Datasets	Out-of ON domain	Scheme compatibility	Multi-genre	Multi-coreference types	Singletons*
OntoNotes (Pradhan et al., 2013)	✗	✓	✓	✓	✗
WikiCoref (Ghaddar and Langlais, 2016)	✓	✓	✗	✓	✗
GAP (Webster et al., 2018)	✓	?	✗	✗	✗
GUM (Zeldes, 2017)	✓	✗	✓	✓	✓
ARRAU (Poesio et al., 2018)	✓	✗	✓	✓	✓
PreCo (Chen et al., 2018)	✓	✗	✓	✓	✓

*Singletons: markables that are not referred to by other mentions in a document

Problems of Existing Out-of-domain Evaluation

- No study has investigated if contextualized embeddings encounter the same overfitting problem identified by Moosavi and Strube (2017)

- Previous work may underestimate the performance degradation on WikiCoref
  - embeddings were also trained on Wikipedia themselves (Moosavi and Strube, 2018)
  - -> higher coreference scores on Wikipedia texts

OntoGUM Dataset (Zhu et al., 2021)

- Conversion from GUM using gold standard syntax trees
- Statistics
  - 168 documents with 12 genres, ~150K tokens
  - 19,378 mentions, 4,471 clusters
  - Growing in size…
- Genres
  - Text: News / Fiction / Bio / Academic / Forum / Travel / How-to / Textbook
  - Speech: Interview / Political / Vlog / Conversation

https://github.com/yilunzhu/ontogum

Dataset Conversion

- OntoNotes $\subseteq$ GUM
  - Don’t need human annotation to recognize additional mentions in the conversion process
- Annotation layers used in the conversion
  - Coreference layer
  - Gold syntax trees
  - Gold speaker information (fiction, reddit and spoken data)
- Deterministic conversion
- Annotation agreement
  - Agreement study on 3 docs (2,500 tokens, 371 mentions), 8/371 errors
  - Span detection: ~0.96 CoNLL coreference score: ~0.92

Conversion process

- Conversion types

  - Remove coreference relations

  - Remove or adjust markables

- Order of Conversion steps

  > Remove bridging (markables)
  Remove cataphora (relations)
  > Contract verbal spans (markables)
  > Merge appositions (markables)
  > Remove NN compounding (markables)
  > Remove copula (markables)
  > Remove nested entities (markables)
  > Adjust chains by definiteness (relations)
  > Remove singletons (markables)

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Conversion example

An example of ***mention deletion interacting with copula*** *(Remove copula)*

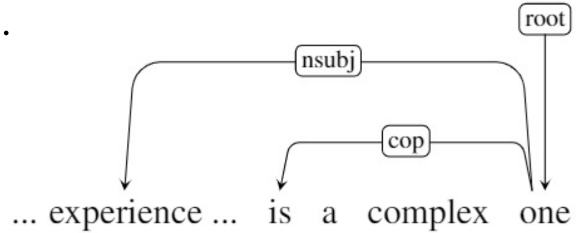
- GUM (before)

The viewing experience of art is a complex one ... The time it takes ...

- OntoGUM (after)

The viewing experience of art is a complex one ... The time it takes ...

Rule: ROOT -> COP



Experiments & Results 1/3

Models	OntoNotes	OntoGUM
dcoref (Manning et al. 2014, CoreNLP)	57.8	
e2e + SpanBERT (Joshi et al., 2019, SOTA)	79.6	

Experiments & Results 1/3

Models	OntoNotes	OntoGUM
dcoref (Manning et al. 2014, CoreNLP)	57.8	39.7
e2e + SpanBERT (Joshi et al., 2019, SOTA)	79.6	64.6

- Both systems encounter a substantial degradation on OntoGUM

Experiments & Results 2/3

- Genre disparity does not guarantee low performance (e.g., vlog), and errors occur readily even in overlapping genres (e.g., news)
- Performance is correlated with the proportions of pronouns

Genres	PRON (R)	Other (R)	Total	CoNLL	Span
vlog	600 (.66)	309 (.34)	909	1	1
interview	1223 (.45)	1485 (.55)	2708	2	6
conversation	729 (.61)	323 (.39)	1052	3	2
speech	245 (.40)	364 (.60)	609	4	4
bio	796 (.34)	1529 (.66)	2325	5	3
fiction	1700 (.61)	1091 (.39)	2791	6	5
academic	262 (.21)	997 (.79)	1259	7	10
voyage	300 (.22)	1053 (.78)	1353	8	7
reddit	1337 (.55)	1077 (.45)	2414	9	8
news	340 (.19)	1483 (.81)	1823	10	9
whow	1001 (.47)	1129 (.53)	2130	11	11
textbook	165 (.34)	315 (.66)	480	12	12

Table 1: Genre-breakdown Statistics of OntoGUM

Experiments & Results 3/3

- Genre disparity does not guarantee low performance (e.g., vlog), and errors occur readily even in overlapping genres (e.g., news)

- Performance is correlated with the proportions of pronouns or gold speaker information

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Conclusion

- We release the largest open, gold, coreference dataset with new genres (singletons in release later) following the OntoNotes scheme
- We present the details of the conversion process
- Results showed a lack of generalizability of existing systems, especially in genres low in pronouns and lacking speaker information
- A genre-by-genre analysis reveals relative strengths and weaknesses of current approaches

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We hope people can use OntoGUM as an out-of-domain benchmark for systems developed using OntoNotes!