The more the merrier

A new dependency treebank for Turkish

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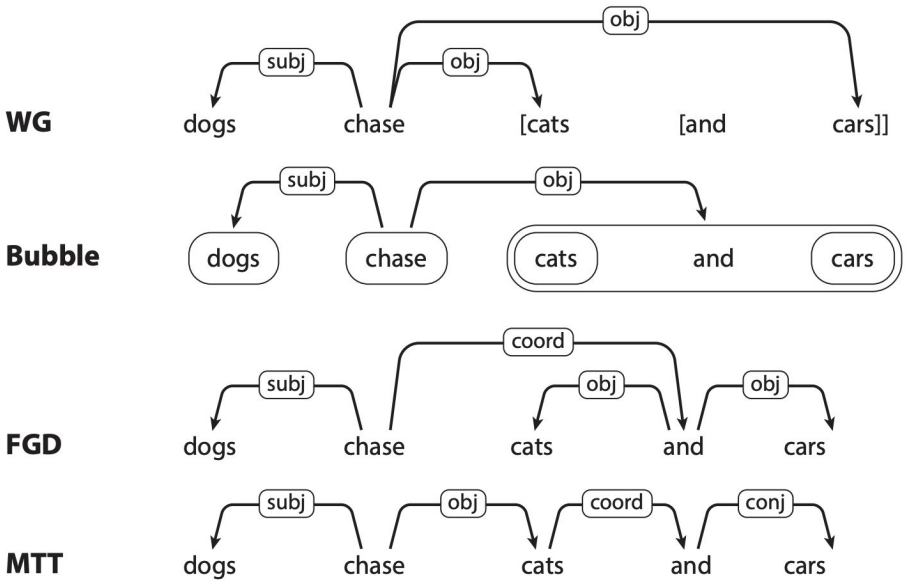
key concepts: dependency grammar

- non-binary structures
- encodes relations between words or word-clusters
- of course, there are bunch of theories
- universal dependencies



Tesnière (1959), Mel’cuk (1988), Milicevic (2006), De Marneffe & Nivre (2019)

key concepts: universal dependencies

- cross-linguistically consistent
- a limited set of morphological and syntactic tags
- to capture idiosyncrasies and similarities
- open community: < 300 contributors, < 200 treebanks, < 100 languages

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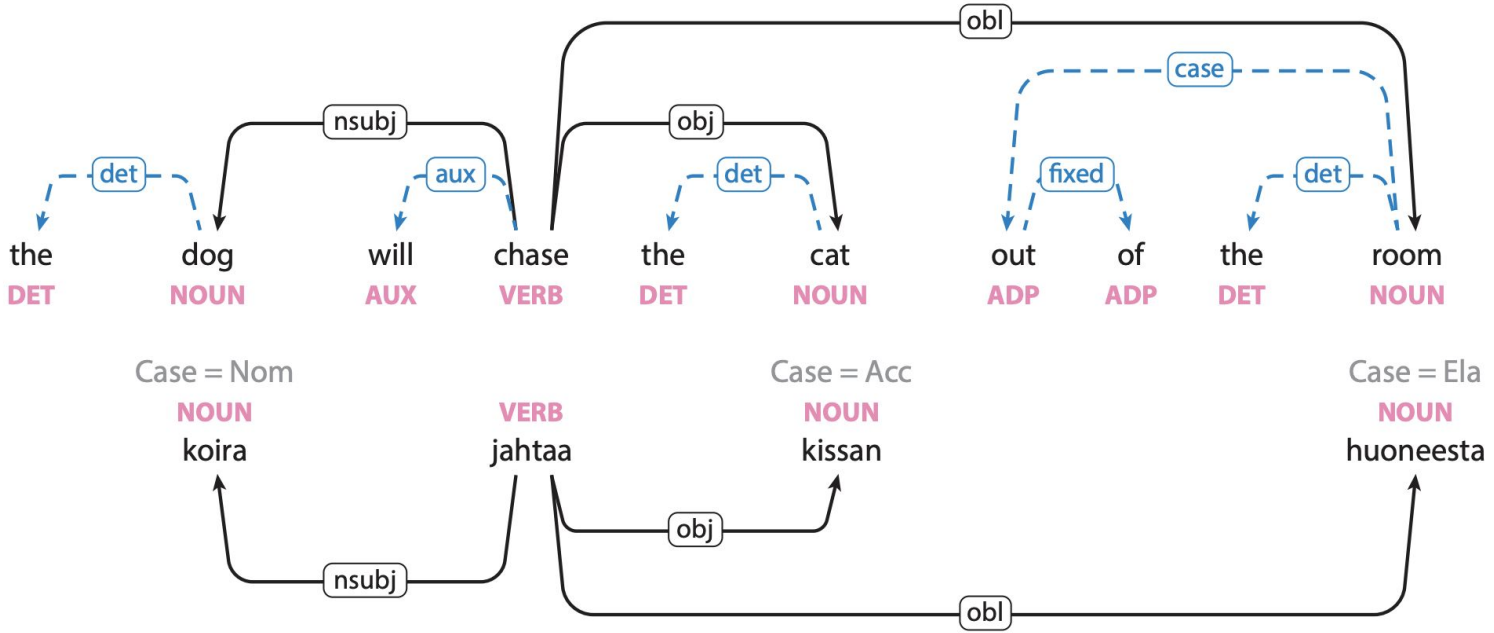
Nivre et al. (2016), www.universaldependencies.org

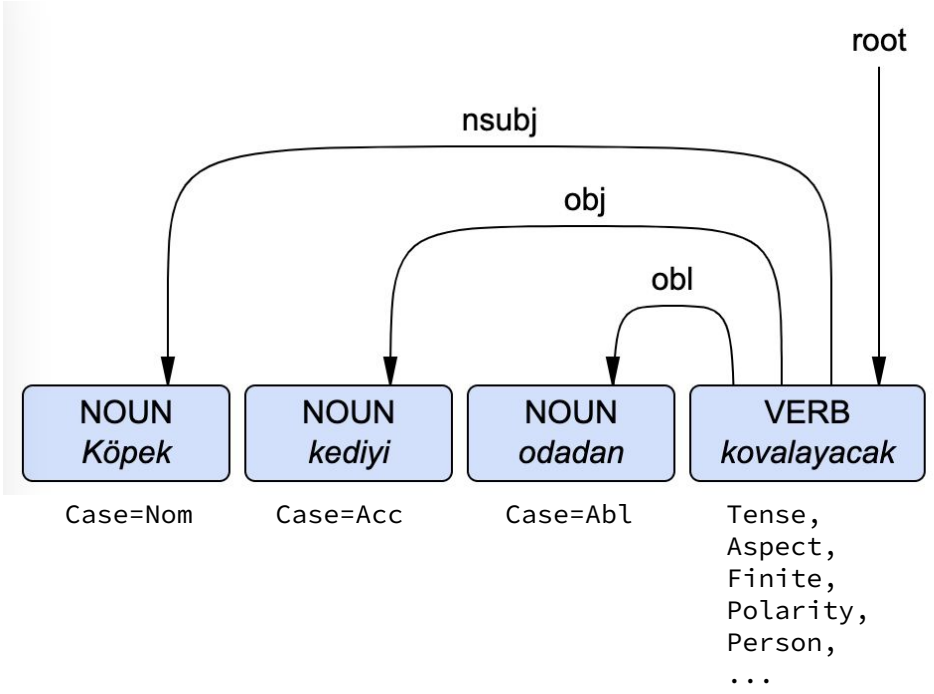
key concepts: universal dependencies



De Marneffe & Nivre (2019)

key concepts: universal dependencies

linguistic details are introduced either using syntactic dependency relations or morphological feature set.



how is Turkish doing?

- not bright until recently

	GB	IMST-UD	PUD	FrameNet	Kenet	Penn	Tourism
N of sentences	2880	5635	1000	2698	18687	9557	19749
N of words	17177	57859	16882	19221	178660	87367	92156
Word per sent.	**5.96**	**10.26**	**16.88**	**7.12**	**9.56**	**9.14**	**4.66**

how is Turkish doing?

- now, it’s alright

	Language	N of words
1.	German	3,753 K
2.	Czech	3,428 K
3.	English	1,880 K
4.	Japanese	1,680 K
…		
14.	**Turkish**	**591 K**

our contribution: BOUN Treebank

	BOUN	GB	IMST-UD	PUD	FrameNet	Kenet	Penn	Tourism
N of sentences	9761	2880	5635	1000	2698	18687	9557	19749
N of words	122383	17177	57859	16882	19221	178660	87367	92156
Word per sent.	12.53	5.96	10.26	16.88	7.12	9.56	9.14	4.66

our contribution: BOUN Treebank

- data gathered from **Turkish National Corpus** (Aksan et al., 2012)

- data distribution:

Genre	N of sentences	N of words
Essays	1953	27557
National Newspaper	1898	29386
Instructional Text	1976	20625
Popular Culture	1962	21263
Biography	1972	23553
Total	**9761**	**122383**

our aims

- proposing our perspective on highly debated topics in UD
  - transparency in embedded clauses,
  - syntactic representation of copular clitics,
  - UD-loyal compound representation,
  - issue of classifiers,
  - what is a core argument?

- providing new data

- new workflow for Turkish UD

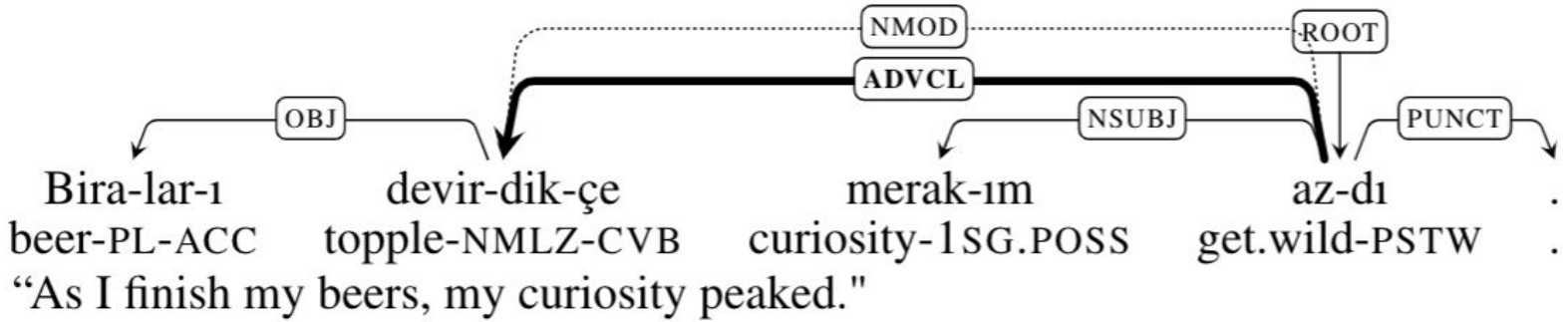
our team & workflow

- 4 linguists and 4 NLP researchers

- discussion on hypothetical sentences
- semi-automatic morphological tagging with Sak et al. (2011)
- individual annotation
- cross-checking and review of annotations
- re-annotation after discussing different applications

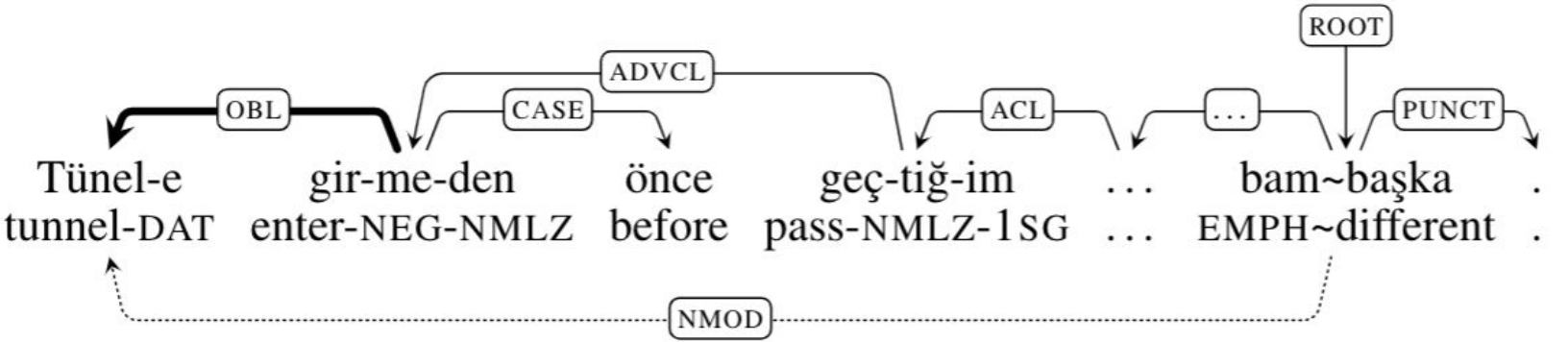
issue #1: embedded sentences

previous annotations does not represent syntactic depth of embedded sentences



issue #1: embedded sentences

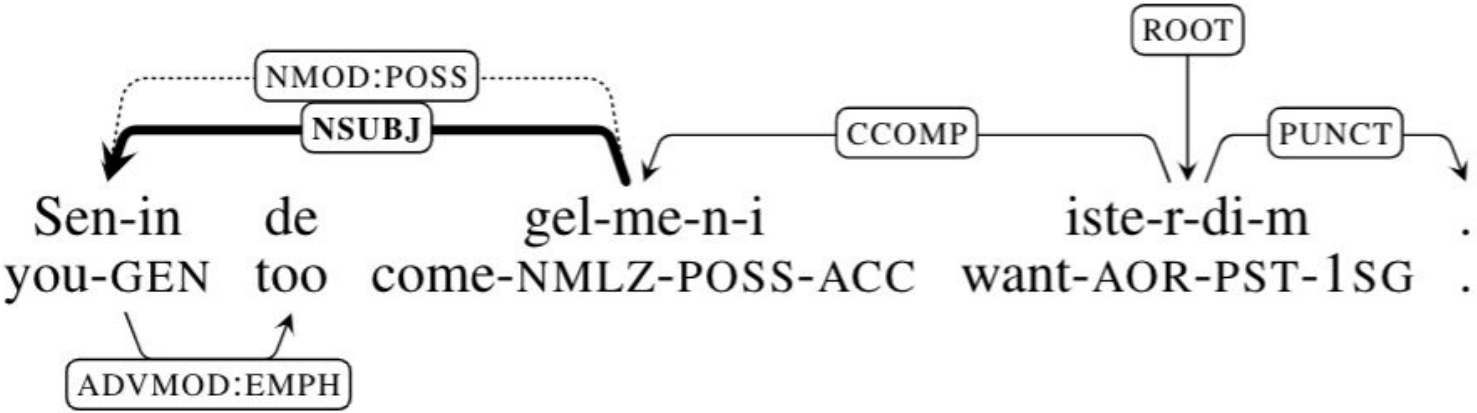
or certain elements are merged to erroneous sites.



'The scenery that I passed before I entered the tunnel was completely different from here.'

issue #1: embedded sentences

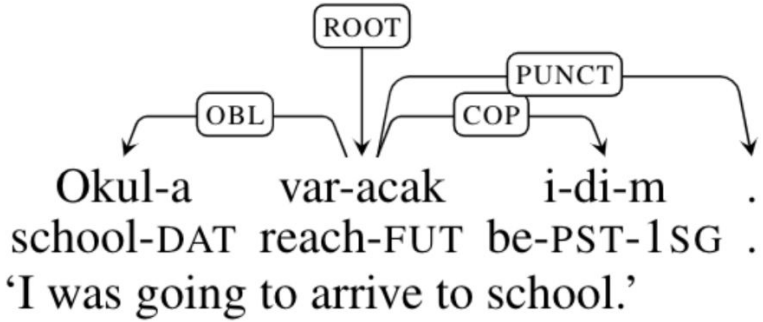
subject or compound?

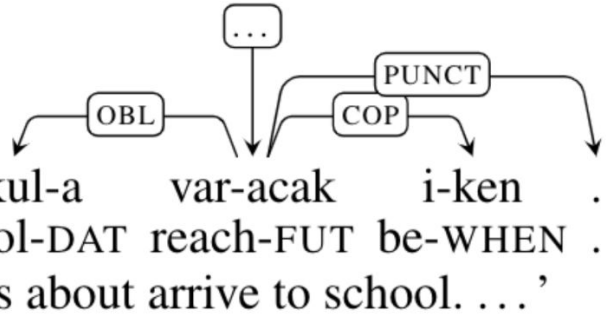


'I would have wanted you to come, as well.'

issue #2: copula

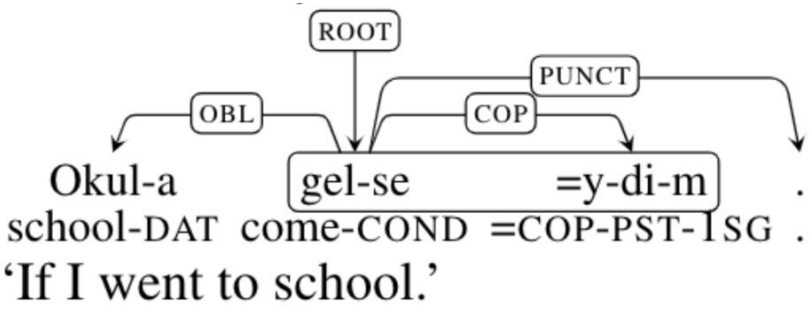
sun is shining bright when the borders of syntactic words are clear

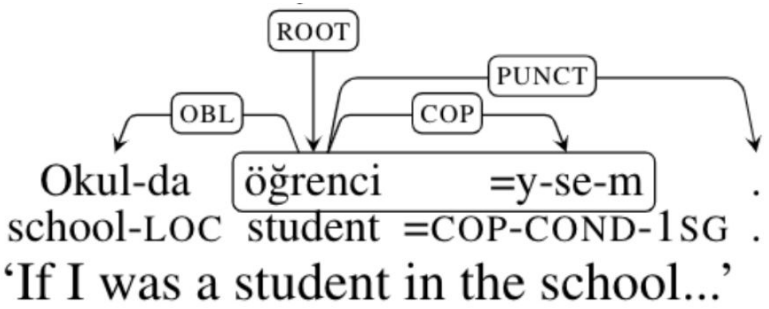




issue #2: copula

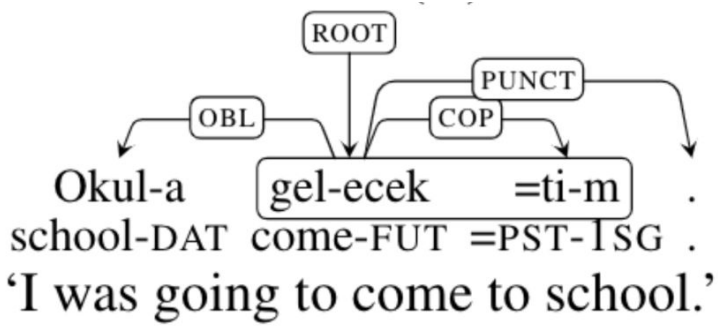
then, what about clitic copulars?

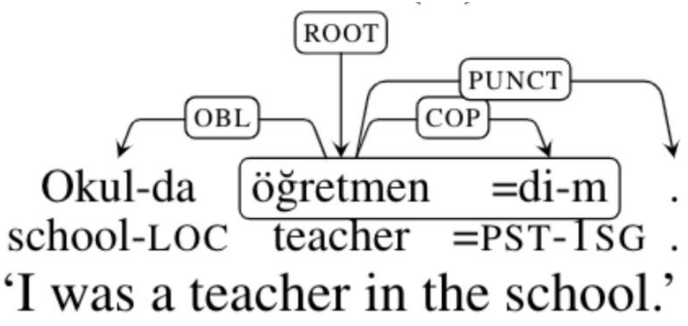




issue #2: copula

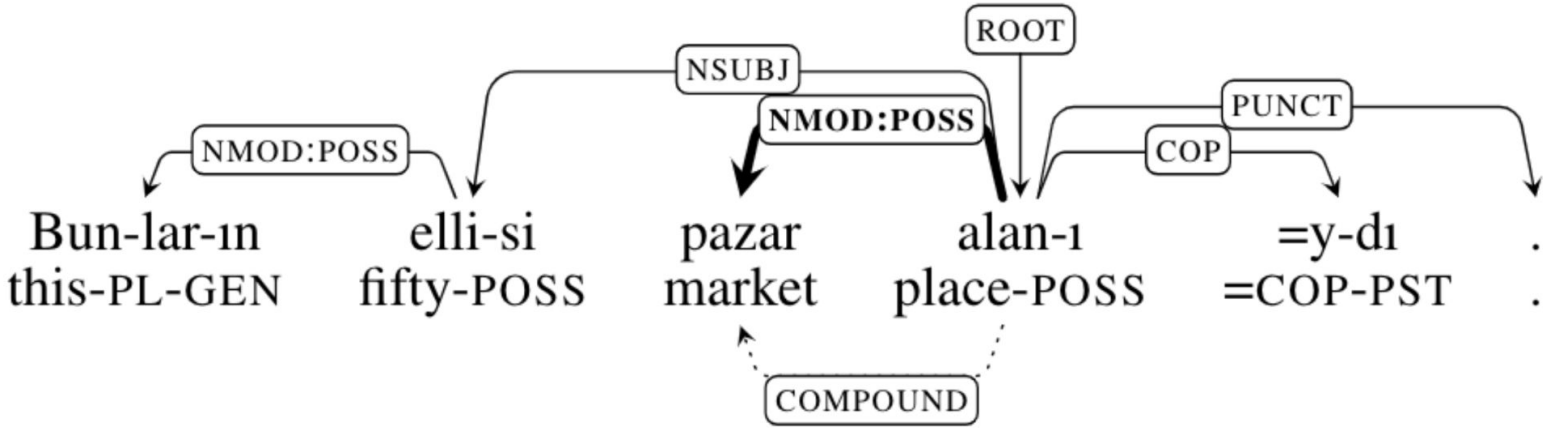
zero copula?





issue #3: compound

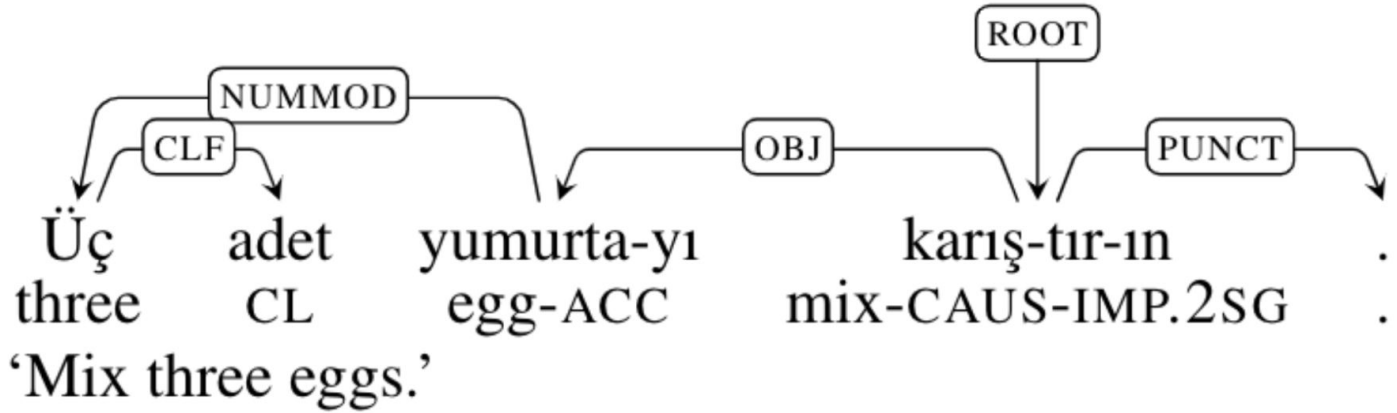
definition is clear, application is all over the place



‘50 of these were marketplaces.’

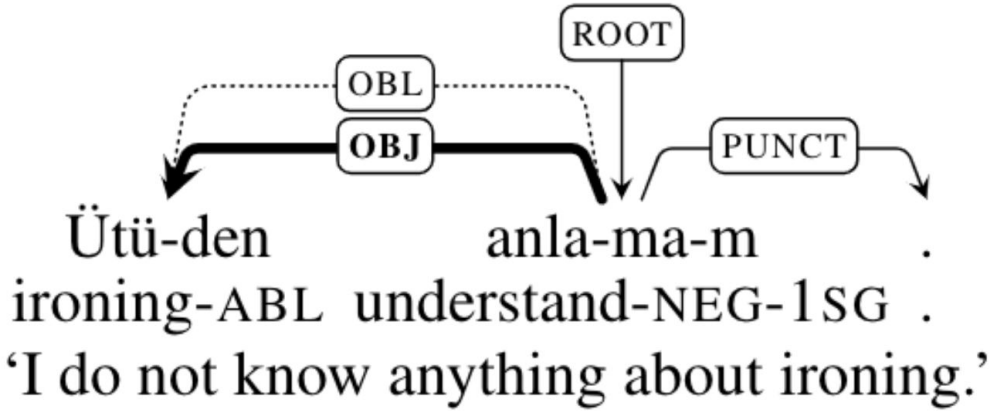
issue #4: classifier

previous annotations of “adet” or “tane” is not unified



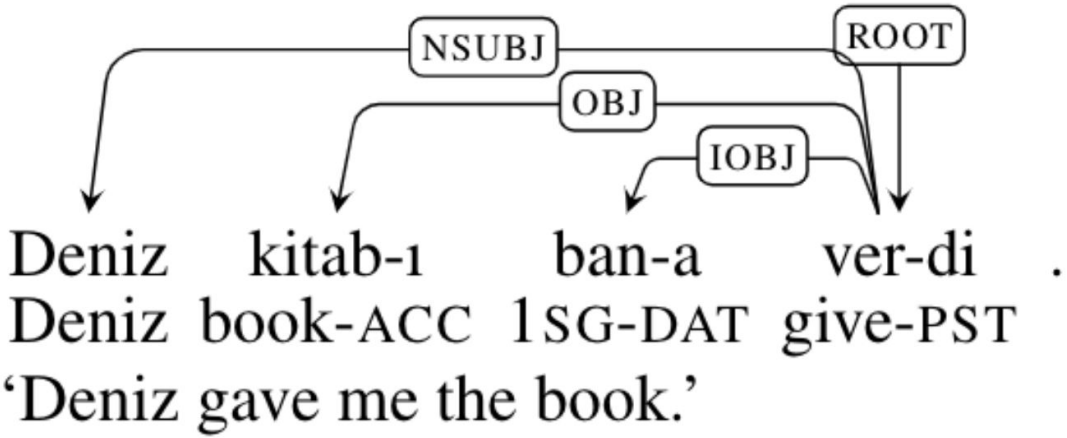
issue #5: core arguments

arguments with lexical cases used to be grouped with adjuncts



issue #5: core arguments

indirect objects as well.



experiments

- **task: predicting syntactic attachment (UAS) and successfully determining syntactic and morphological tags (LAS)**
- Stanford's neural parser (Dozat et al., 2017; Kanerva et al., 2018)
- unidirectional LSTM for word embeddings
- bidirectional LSTM for head-dependency relations
- randomly assigned training (80%), development (10%), and test (10%)

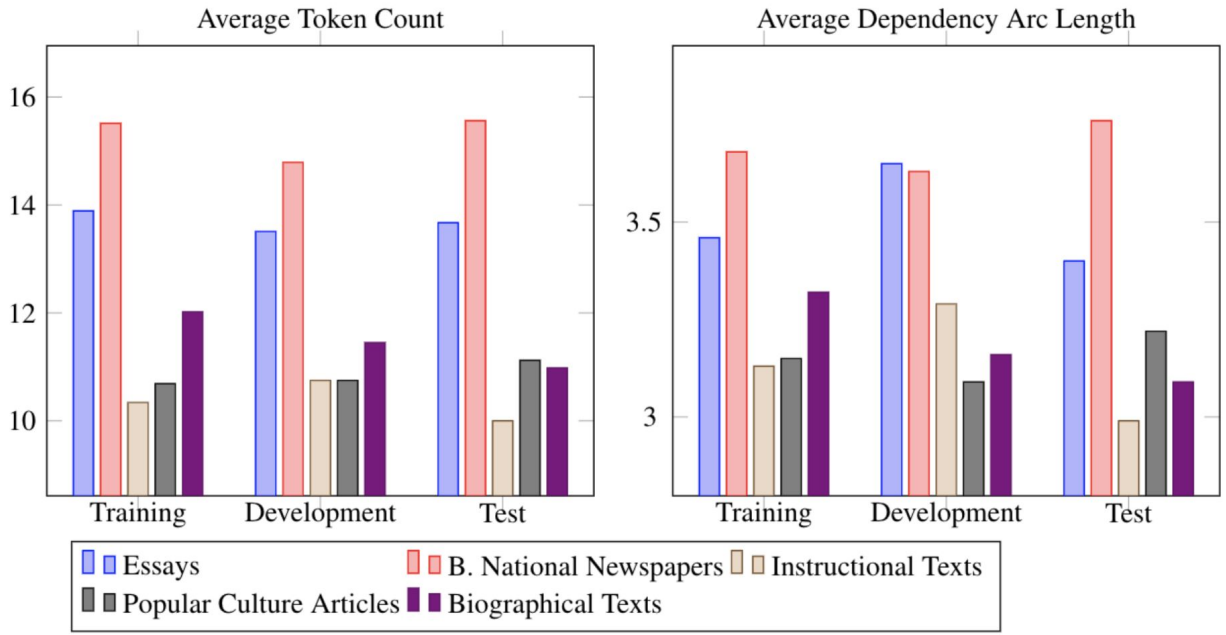
experiments: BOUN

predictive parsing results are generally uniform, except for essays. but why?

Genre	UAS F1-Score	LAS F1-Score
Essays	68.73	59.18
National Newspaper	81.59	76.04
Instructional Text	79.22	72.65
Popular Culture	77.69	71.13
Biography	80.28	73.68
Total	**77.36**	**70.37**

experiments: BOUN

*maybe, **number of words** or **locality**? not supported.*



experiments: pooled

training size and training data quality seems effective

Training set	Training size	Test set	Test size	UAS F1-score	LAS F1-score
IMST-UD	3,685	BOUN	979	69.38	58.65
BOUN	7,803	BOUN	979	77.36	70.37
BOUN+IMST-UD	11,488	BOUN	979	77.57	70.50
IMST-UD	3,685	IMST-UD	975	75.49	65.53
BOUN	7,803	IMST-UD	975	73.63	62.92
BOUN+IMST-UD	11,488	IMST-UD	975	76.86	66.79
IMST-UD	3,685	PUD	1,000	65.28	49.50
BOUN	7,803	PUD	1,000	72.33	59.57
BOUN+IMST-UD	11,488	PUD	1,000	72.76	60.39
IMST-UD	3,685	BOUN+IMST-UD	1,954	71.89	61.62
BOUN	7,803	BOUN+IMST-UD	1,954	75.67	66.99
BOUN+IMST-UD	11,488	BOUN+IMST-UD	1,954	77.25	68.82
IMST-UD	3,685	BOUN+IMST-UD+PUD	2,954	69.03	56.37
BOUN	7,803	BOUN+IMST-UD+PUD	2,954	74.22	63.78
BOUN+IMST-UD	11,488	BOUN+IMST-UD+PUD	2,954	75.30	65.17

takes

- discrepancy in parsing results **are not due to** average token count and arc length
  - maybe, due to the nature of the texts?
- more data provide better parsing results
- linguistically-adequate annotations enhance treebank quality, thus parsing results

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