Annotating Coordination in the Penn Treebank

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Definitions

Coordination

- A syntactic structure consisting of two or more elements (*conjuncts*), with one or more conjuncts typically, but not always preceded by a coordinating conjunction (*and*, *or*, *neither...nor*, and *but*).
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Conjunct

- Lexical or phrasal material of any kind
- Typically, but not necessarily, a complete constituent

Examples

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b. Loch Ness is a lake in Scotland and famous for its monster (*unlike coordination*)
c. Sandy gave a record to Sue and a book to Leslie (*non-constituent coordination*)
d. Leslie likes bagels and Sandy donuts (*gapping structure with elliptical conjunct*)

Coordination detection and scope identification

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- Consider parsing:
  - Improved coordination parsing helps overall parse quality
  - Downstream NLP applications also benefit

Previous work

- Coordinations of noun compounds ("oil and gas resources") [Nakov and Hearst, 2005],
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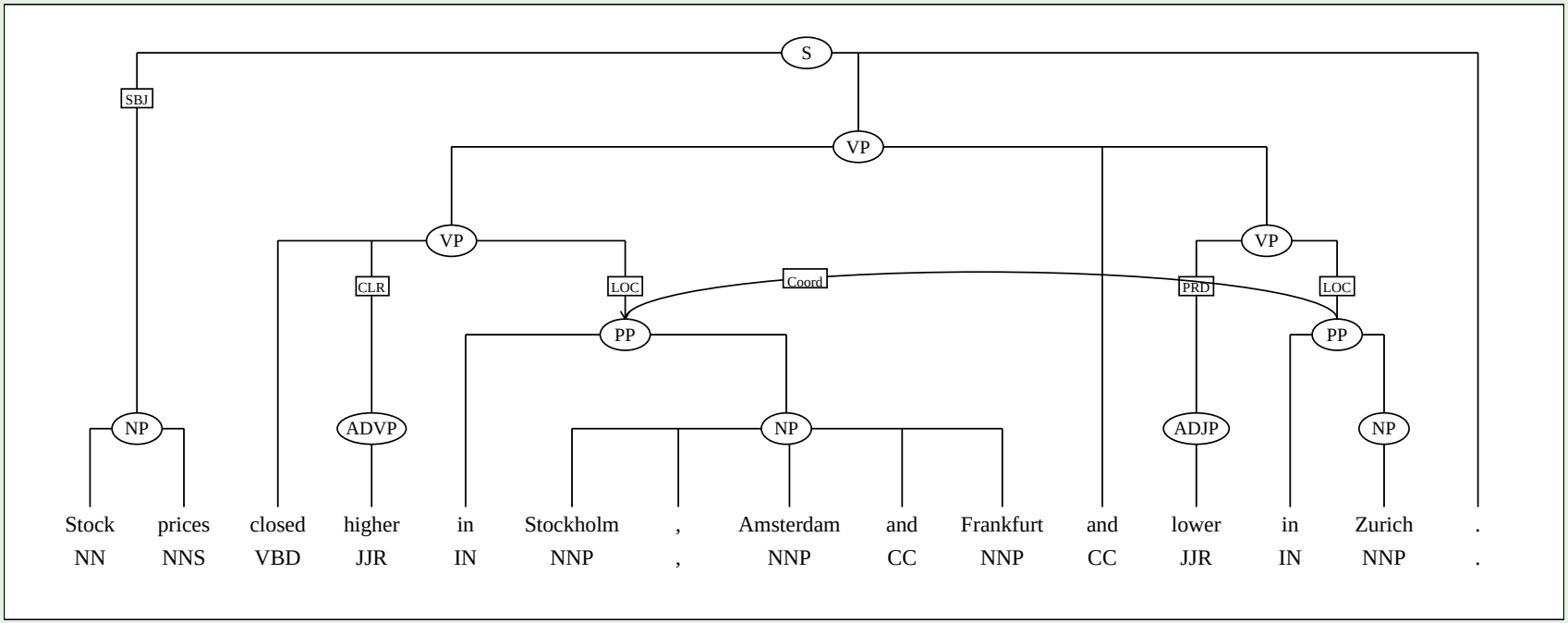
To our knowledge, no approach for *all* coordination types

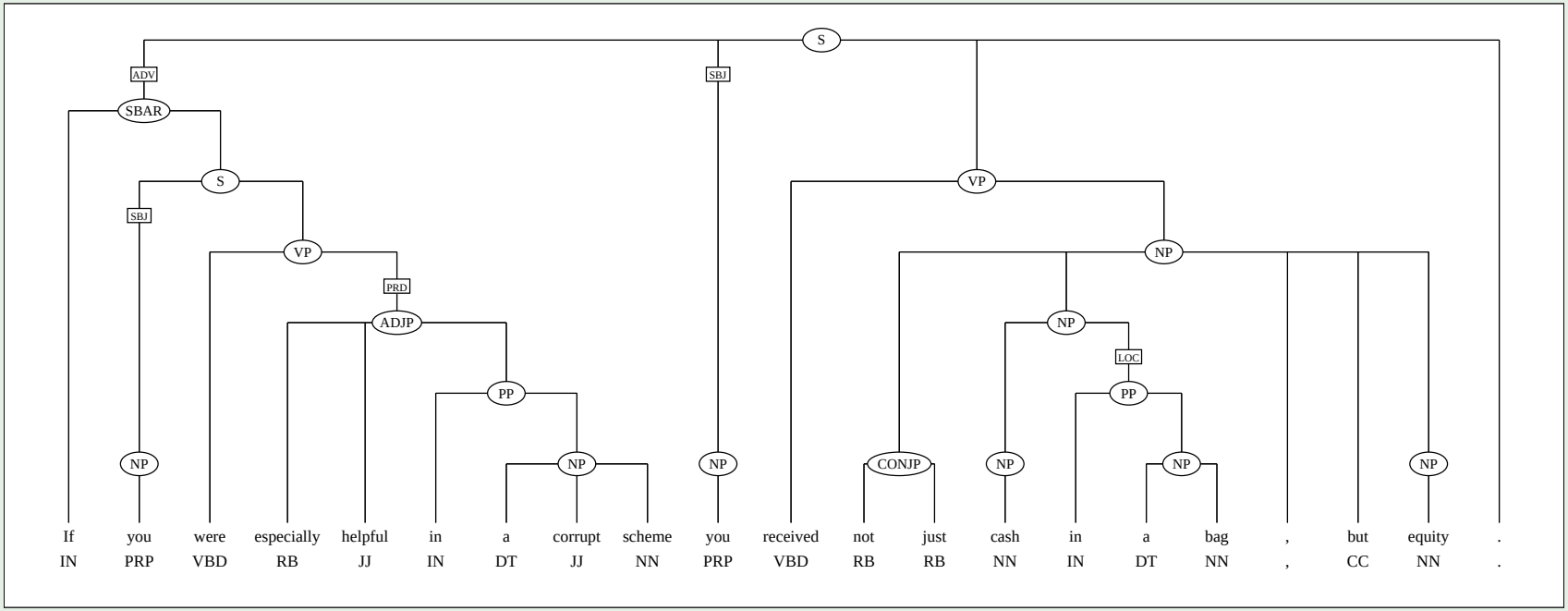
The Penn Treebank annotation principles for coordination

- Annotated on lowest level possible
- One word conjuncts coordinated on word level
- In gapped structures, symmetrical elements in conjuncts marked by gap-coindexation



The Penn Treebank annotation principles for coordination

- Multiword conjunctions grouped into `CONJP` constituents



The problem: Conjunct boundaries

- Special POS tag for coordinating conjunctions, but not for coordinating punctuation
- Handling > 2 conjuncts is difficult!

Our work

We present

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1. a proposal for an extended annotation of the Penn Treebank which facilitates the identification of coordination
2. a variety of phenomena which must be taken into account for a thorough treatment of coordination

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Consider a punctuation token c with left and right neighbor tokens l and r (not considering intervening coordinating conjunctions).

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  - the phrases directly below A which cover r, resp. l have the same label, or
  - A is labeled `UCP` (unlike coordination)

Why no automatic annotation?

Some manual decisions are necessary!

Coordination vs. apposition (1)

- Appositions can look like conjuncts
- Often have same category as modified constituent and attached at the same level

(2) The last two months have been the whole ball game , " says [$_{NP}$ Steven Norwitz] , [$_{NP}$ a vice president] . (PTB 15034)

Coordination vs. apposition (2)

Similar case: NP modification by temporal NP

(3) – : Letter from Eduard Shevardnadze to U.N. Secretary-General Perez de Cuellar , reported in [$_{NP}$ Tass] , [$_{NP-TMP}$ June 10 , 1988] . (PTB 21148)

Coordination vs. apposition (3)

- Border cases difficult to decide, especially with negated second phrase
- In case of doubt, use *and* substitution test

(4) He is [$_{NP}$ **a mechanical engineer**] , [$_{NP}$ **not an atmospheric chemist**] . (PTB 7158)

Ambiguous punctuation

- Irregular usage of commas in the PTB
- One finds "A, B, and C", "A, B and C" and even "A, and B"
- Covered by annotation guidelines

Ambiguous punctuation

(5) a. Describing itself as " asset rich , " Sea Containers said it will move immediately to sell [$_{NP}$ **two ports**] , [$_{NP}$ **various ferries**] , [$_{NP}$ **ferry services**] , [$_{NP}$ **containers**] , and [$_{NP}$ **other investments**] . (PTB 6105)

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b. Stocks closed higher in [$_{NP}$ **Hong Kong**] , [$_{NP}$ **Manila**] , [$_{NP}$ **Singapore**] , [$_{NP}$ **Sydney**] and [$_{NP}$ **Wellington**] , but were lower in Seoul . (PTB 4369)

Ambiguous punctuation (2)

- Sometimes, the comma before a coordinating conjunction belongs to the preceding constituent
- Handeled by our annotation guidelines, since in the PTB, the comma is attached low to preceding constituent (e.g., an apposition)

Ambiguous punctuation (2)

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b. . . . Gillette South Africa will sell [$_{NP}$ manufacturing facilities in Springs , South Africa ,] and [$_{NP}$ its business in toiletries and plastic bags] to Twins Pharmaceuticals Ltd. . . . (PTB 6154)

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b. . . . Gillette South Africa will sell [$_{NP}$ manufacturing facilities in Springs , South Africa ,] and [$_{NP}$ its business in toiletries and plastic bags] to Twins Pharmaceuticals Ltd. . . . (PTB 6154)

c. [$_{S}$ I want white America to talk about it , too ,] but [$_{S}$ I 'm convinced that the grapevine is what 's happening] . " (PTB 10130)

Ambiguous punctuation (3)

- Also ambiguous: Coordinate structures on clausal level
- Often only uses commas or semicolons (no overt conjunctions)
- Difficult to distinguish automatically from other types of parataxis
- Again in case of doubt, use *and* substitution test

Ambiguous punctuation (3)

Annotated as coordination

(7) a. [$_S$ **In 1980 , 18 % of federal prosecutions concluded at trial**] ; [$_S$ **in 1987 , only 9 % did**] . (PTB 12113)

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Annotated as coordination

(7) a. [$_S$ **In 1980 , 18 % of federal prosecutions concluded at trial**] ; [$_S$ **in 1987 , only 9 % did**] . (PTB 12113)

b. [$_S$ **Various ministries decided the products businessmen could produce and how much**] ; and [$_S$ **government-owned banks controlled the financing of projects and monitored whether companies came through on promised plans**] . (PTB 12355)

Ambiguous punctuation (3)

Not annotated as coordination

(8) a. [$_S$ This does n't necessarily mean larger firms have an advantage] ; [$_S$ Mr. Pearce said GM works with a number of smaller firms it regards highly] . (PTB 12108)

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(8) a. [$_S$ This does n't necessarily mean larger firms have an advantage] ; [$_S$ Mr. Pearce said GM works with a number of smaller firms it regards highly] . (PTB 12108)

b. [$_S$ Senator Sasser of Tennessee is chairman of the Appropriations subcommittee on military construction] ; [$_S$ Mr. Bush 's $ 87 million request for Tennessee increased to $ 109 million] . (PTB 12223)

Non coordinative use of punctuation

- Some sentences show coordinating conjunctions in appositions.
- Example: Syntactic annotation/annotation guidelines make it look like coordination

(9) a. The NASD , which operates the Nasdaq computer system on which 5,200 OTC issues trade , compiles short interest data in [$_{NP}$ two categories] **:** [$_{NP}$ the approximately two-thirds . . . ; and the one-third . . .] . (PTB 21080)

Non-coordinative use of punctuation

- Example: Syntactic annotation/annotation guidelines identify it as a non-coordination
- Reason: Coordinating conjunction grouped under parenthetical node (`PRN`) or under fragment (`FRAG`).

(10) a. Martha was [$_{ADJP}$ pleased , [$_{PRN}$ but nowhere near as much as Mr. Engelken]] . (PTB 14598)

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(10) a. Martha was [$_{ADJP}$ pleased , [$_{PRN}$ but nowhere near as much as Mr. Engelken]] . (PTB 14598)
b. The HUD scandals will simply [$_{VP}$ continue , [$_{FRAG}$ but under new mismanagement]] . (PTB 15629)

Coordination in NP premodification

- PTB annotation guidelines: Conjuncts project to phrase level
- Exception: NP premodifiers only project if longer than one word
- We treat all NP premodifiers as coordinating

Coordination in NP premodification

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b. There 's nothing in the least contradictory in all this , and it would be nice to think that Washington could tolerate a [$_{ADJP}$ **reasonably sophisticated**] , [$_{JJ}$ **complex**] view . (PTB 8018)

c. Perhaps the shock would have been less if they 'd fixed to another [$_{NN}$ **low-tax**] , [$_{VBN}$ **deregulated**] , [$_{JJ}$ **supply-side**] economy . (PTB 10463)

Data set

- A look at coordination statistics in the PTB
- Collected from 23,678 sentences (605,064 words), average sentence length 25.6 words

	full		av. per sentence	
	total	coord.	total	coord.
,	28,853	3,924	1.22	0.17
;	684	547	0.03	0.02
CCs	14 267		0.60	

Annotation properties

- Statistics over noun phrases
- Without the annotation, a significant number of conjuncts is lost

Number of conj.	w/ annot.	w/o annot.
2	12 689	13 917
3	2 243	1 195
4	653	220
5	234	35
6	90	18
≥ 7	94	0

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2. We have proposed an extension for the Penn Treebank annotation from which NLP applications will profit
3. We plan on making the annotation publicly available

Thank you for your attention!

Questions?

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