Using Treebanked Corpora: Universal Dependencies

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What is a Treebank?

- Syntactically annotated corpus
- (usually) it features:
  - Lemmatization (disambiguated)
  - Morphological features (disambiguated)
  - Syntactic analysis

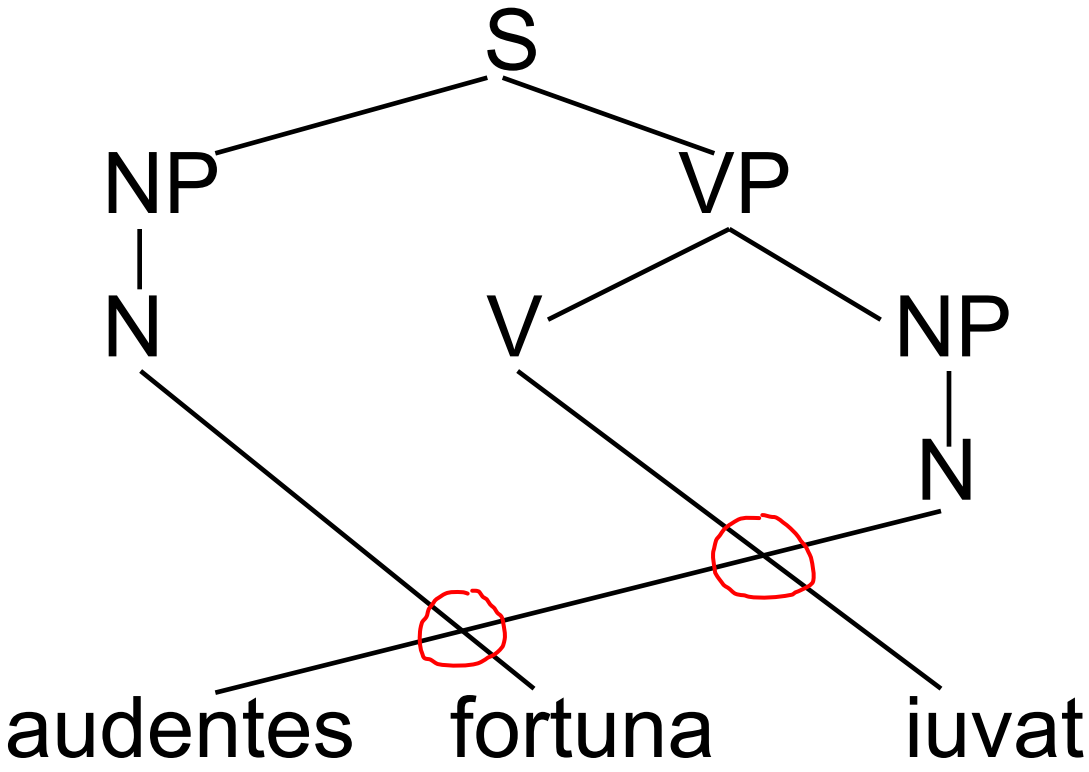
Which ‘Seeds’ for the Trees?

- Phrase Structure Grammars (PSG):
  - Words, PoS, Phrases, Start Symbols
  - Set inclusion: categorisation (e.g.: word, N, NP, S)

- Dependency Grammars (DG):
  - Only words (terminals in PSG)
  - Lexical nodes are connected via binary and hierarchical relations (“dependencies”)
  - Ho horizontal relation or cycle
  - No word order marking
  - Suitable for describing free-word-order languages: Dutch (Alpino), Italian (TUT), Czech (PDT), Latin (IT-TB; LDT; PROIEL)…

Example (PSG)

Audentes fortuna iuvat



Example (DG)

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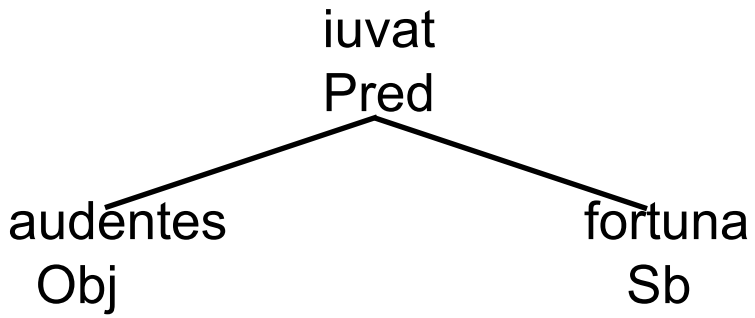
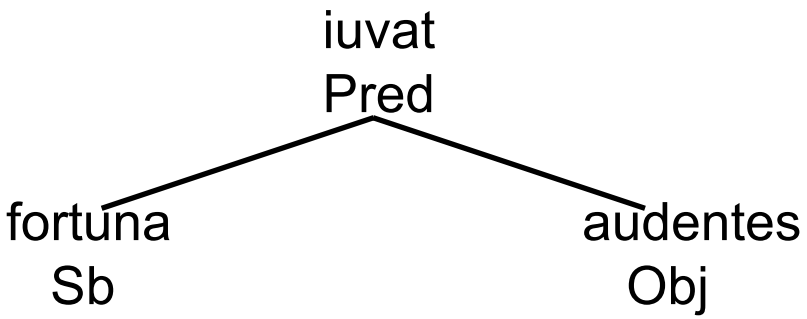




Basics of Universal Dependencies

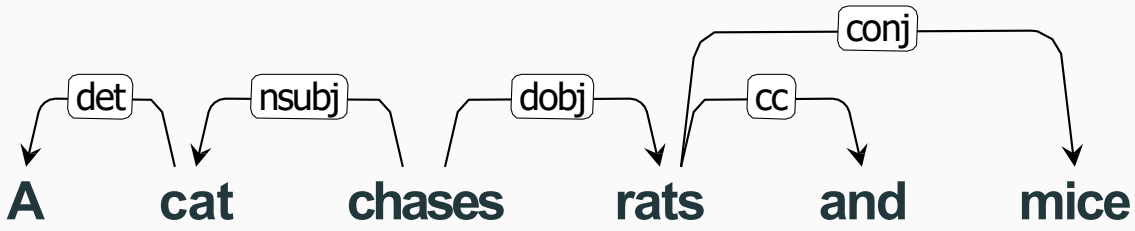
- http://universaldependencies.org/
- “cross-linguistically consistent treebank annotation for many languages” (129 treebanks for 76 languages in v. 2.3)
- available via LINDAT-CLARIN

Slides based on those of the EACL Tutorial on Universal Dependencies
http://universaldependencies.org/eacl17tutorial/

Why UDs?

Increasing interest in multilingual NLP
- Multilingual evaluation campaigns to test generality
- Cross-lingual learning to support low-resource languages

Increasing awareness of methodological problems
- Current NLP relies heavily on annotation
- Annotation schemes vary across languages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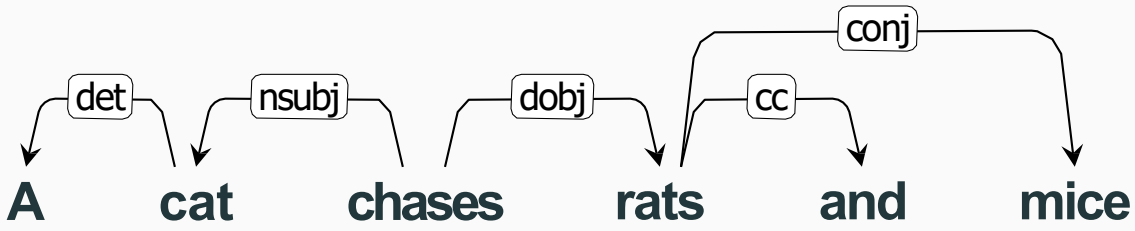
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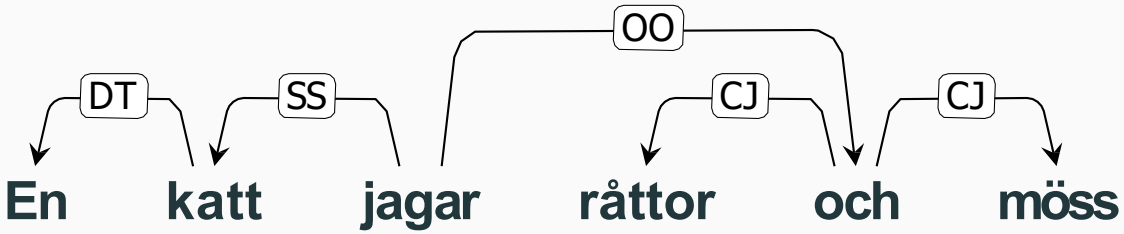
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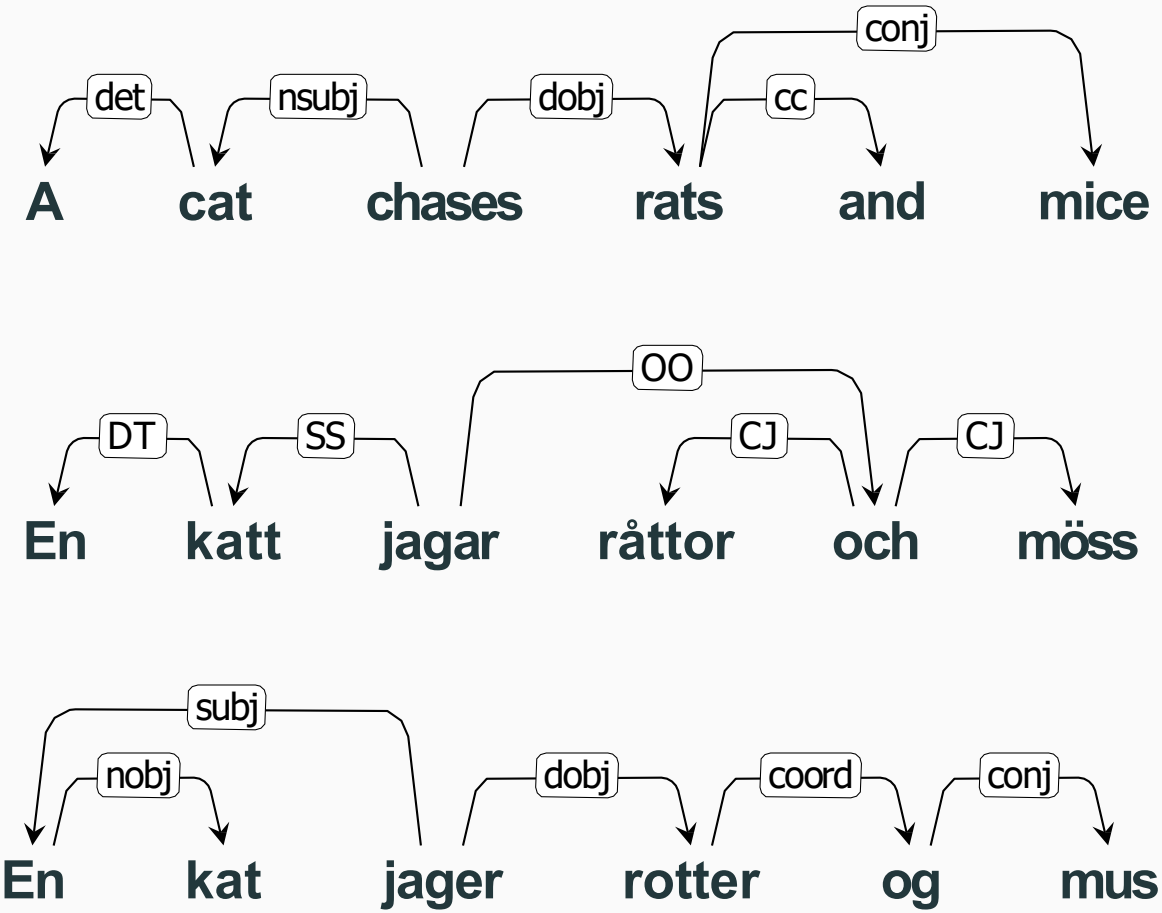
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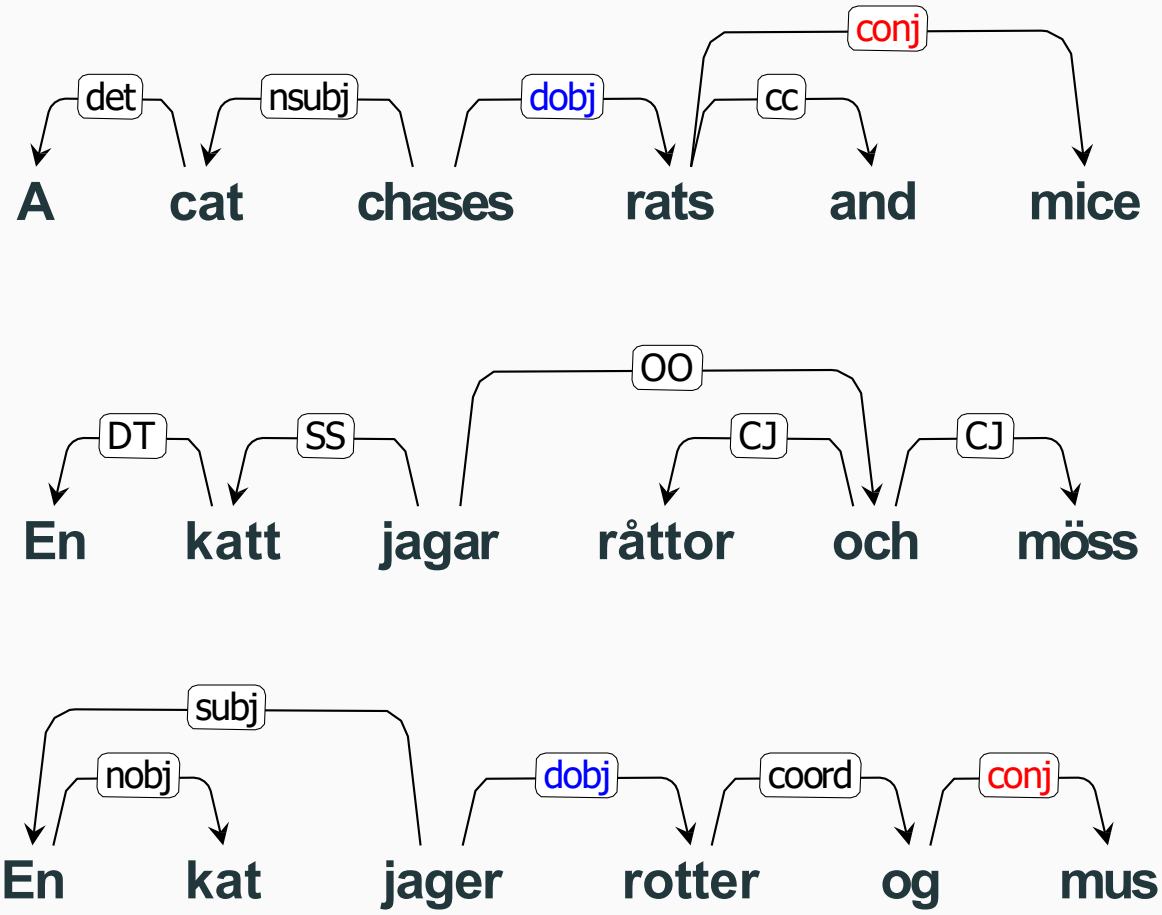
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Why is This a Problem?

- Hard to compare empirical results across languages
- Hard to usefully do cross-lingual structure transfer
- Hard to evaluate cross-lingual learning
- Hard to build and maintain multilingual systems
- Hard to make comparative linguistic studies
- Hard to validate linguistic typology
- Hard to make progress towards a universal parser

Solution

- Cross-linguistically consistent grammatical annotation
- Build on common usage and existing de facto standards
- Complement – not replace – language-specific schemes
- Open community effort!

The UDs Philosophy

Merging existing initiatives to build consistent LRs:

- Interset Interlingua for morphosyntactic tagsets ← a tool for conversion between tagsets of multiple languages (2006 → HamleDT, 2013)
- Google Universal PoS tags ← cross-linguistic error analysis based on the CoNLL-X shared task data (2007)
- Stanford Dependencies: de facto standard for dependency analysis of English (2005)
- Google Dependency Scheme: first attempt to combine Stanford Dependencies & Google Universal PoS tags towards a universal annotation scheme (UDT, 2013) → Universal Stanford Dependencies (USD, 2014)

UD wants to replace all these with a single coherent standard

UDs Design Principles

- *Dependency*
  - –Widely used in practical NLP systems
  - –Available in treebanks for many languages
- *Lexicalism*
  - –Basic annotation units are words – syntactic words: clitics are split off (Spanish: *dámelo* = *dá me lo*) and contractions are undone (French *au* = *à le*)
  - –Words have morphological properties
  - –Words enter into syntactic relations
- *Recoverability*
  - –Syntactic wordhood does not always coincide with wehitespace-sperated orthographic units
  - –Transparent mapping from input text to word segmentation

Morphological Annotation

Le	chat	chasse	les	chiens	.
le	chat	chasser	le	chien	.
DET	NOUN	VERB	DET	NOUN	PUNCT
Definite=Def Gender=Masc Number=Sing	Gender=Masc Number=Sing	Mood=Ind Number=Sing Person=3 Tense=Pres VerbForm=Fin	Definite=Def Gender=Masc Number=Plur	Gender=Masc Number=Plur	

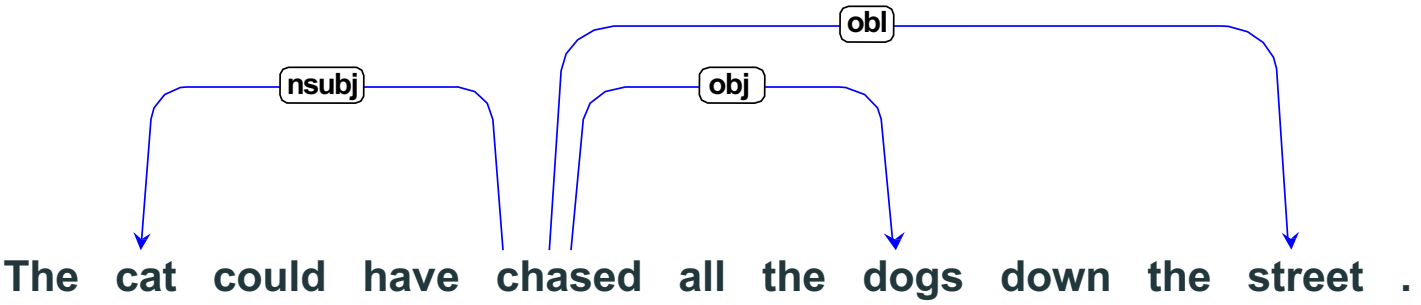
- Lemma
- Part-of-speech tag
- Features

Syntactic Annotation

The cat could have chased all the dogs down the street .

- Content words are related by dependency relations
- Function words attach to the content word they modify
- Punctuation attach to head of phrase or clause

Syntactic Annotation



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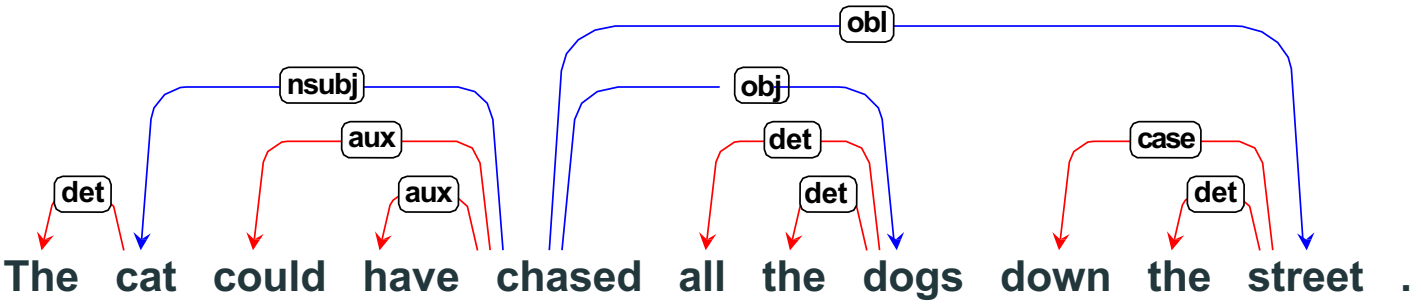

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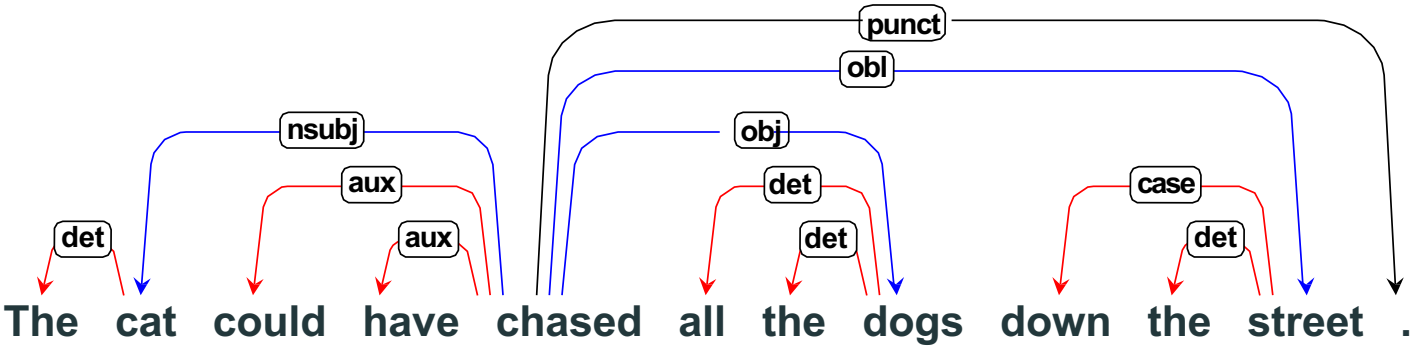

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CoNLL-U Format

Different in UDs v2

```
# sent_id 1
# ...
1    They     they     PRON    PRP    Case=Nom|Number=Plur                2   nsubj    4:nsubj    _
2    buy      buy      VERB    VBP     Number=Plur|Person=3|Tense=Pres    0    root     _          _
3    and      and      CONJ    CC     _                                   2   cc       _          _
4    sell     sell     VERB    VBP     Number=Plur|Person=3|Tense=Pres    2    conj     0:root     _
5    books    book     NOUN    NNS    Number=Plur                         2   dobj     4:dobj     SpaceAfter=No
6    .        .        PUNCT   .      _                                   2   punct    _          _

# sent_id 2
# ...
1     I         I       PRON    PRP    Case=Nom|Number=Sing|Person=1       2   nsubj    _   _
2-3   haven't   _       _       _      _                                   _   _        _   _
2     have      have    VERB    VBP     Number=Sing|Person=1|Tense=Pres    0    root     _   _
3     not       not     PART    RB     Negative=Neg                        2   neg      _   _
4     a         a       DET     DT     Definite=Ind|PronType=Art           4   det      _   _
5     clue      clue    NOUN    NN     Number=Sing                         2   dobj     _   SpaceAfter=No
6     .         .       PUNCT   .      _                                   2   punct    _   _
```

CYCLE!: 4 instead of 5

Querying UDs
Introducing PML-TQ

PML-TQ

Query Elements

- Node-types:
  - `a-node / a-root`
  - `t-node / t-root`
- Attributes: `deprel, tag ...`
- Relations: `child, parent ...`
- Operators: `=, !=, > ...`
- Naming the nodes: `$a :=`
- Lists in output: `>> for…give…sort by…desc`

PML-TQ

http://lindat.mff.cuni.cz/services/pmltq/#!/home

Query examples. Treebank: UDLA-PROIEL 2.3

```
# Nominal Subjects
a-node [ deprel = 'nsubj' ]

# Word Order: Verb - Nominal Subject
a-node $a := [ deprel='nsubj', tag='NOUN',
parent a-node $b := [ tag='VERB', id < $a.id] ]

# Conjunct Nominal Subjects (list of couples)
a-node $a := [ deprel='nsubj', tag='NOUN',
child a-node $b := [ deprel='conj' ] ]
>> for $a.lemma, $b.lemma give $1, $2, count()
sort by $3 desc,$1,$2
```