Universal Dependencies: Syntax

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July 22, 2026

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https://ufal.mff.cuni.cz/courses/dz-2026-07-bh

Outline

Same Annotation

Universal Dependencies

- Same things annotated same way across languages...
- ... while highlighting different coding strategies

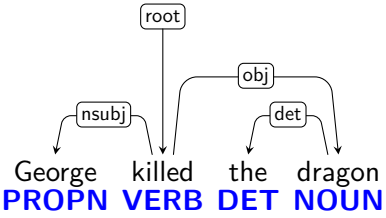
Manning's Law

The secret to understanding UD is to realize that the design is a very subtle compromise between approximately 6 things:

1. UD must be satisfactory on linguistic analysis grounds for individual languages.
2. UD must be good for linguistic typology, i.e., providing a suitable basis for bringing out cross-linguistic parallelism across languages and language families.
3. UD must be suitable for rapid, consistent annotation by a human annotator.
4. UD must be easily comprehended and used by a non-linguist, whether a language learner or an engineer with prosaic needs for language processing. … it leads us to favor traditional grammar notions and terminology.
5. UD must be suitable for computer parsing with high accuracy.
6. UD must support well downstream language understanding tasks (relation extraction, reading comprehension, machine translation, …)

It's easy to come up with a proposal that improves UD on one of these dimensions. The interesting and difficult part is to improve UD while remaining sensitive to all these dimensions.

Same Thing Same Way



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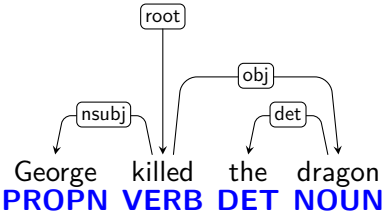

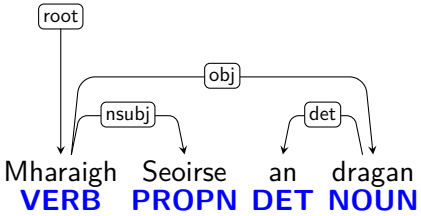

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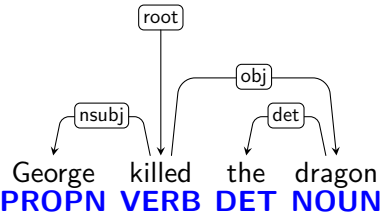

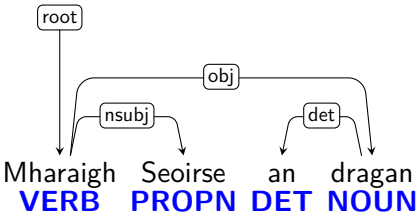

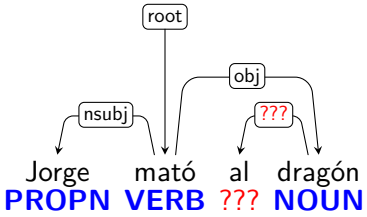

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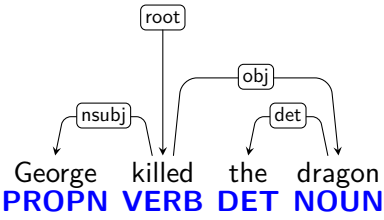

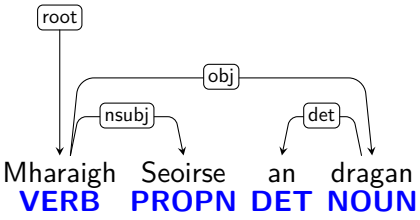

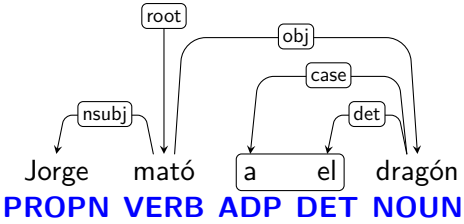

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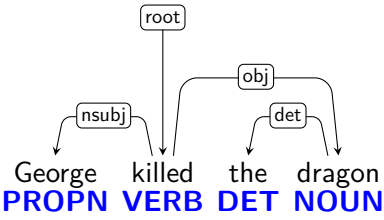
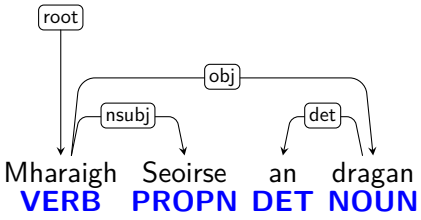
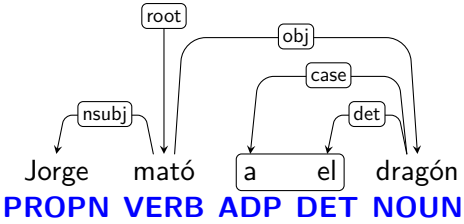
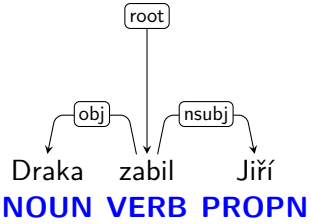
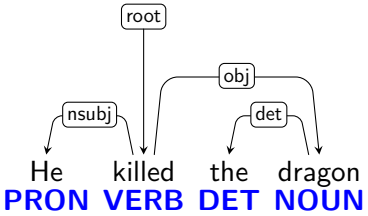








Same Meaning ≠ Same Construction!



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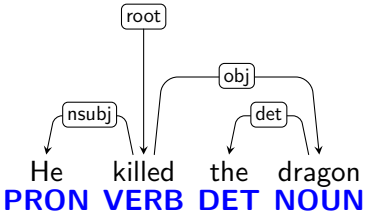

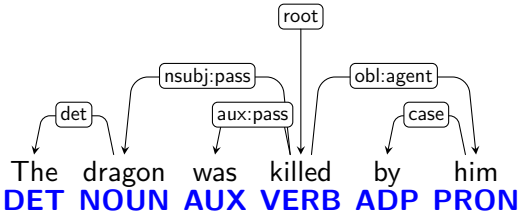

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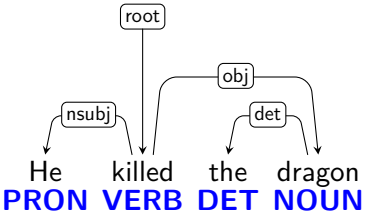

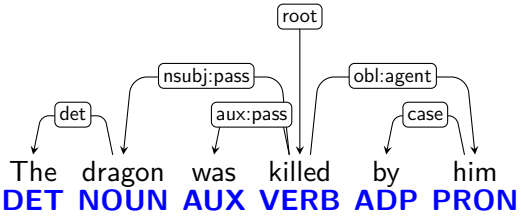

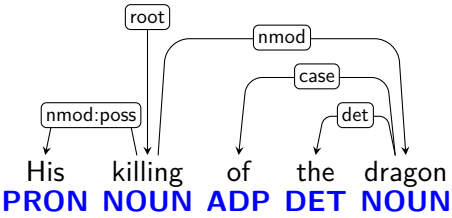

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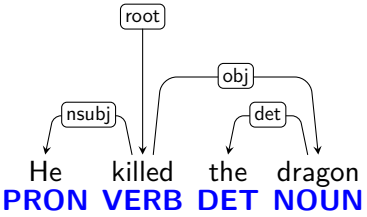
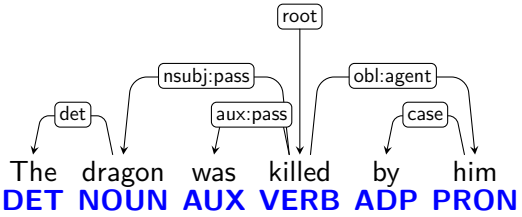
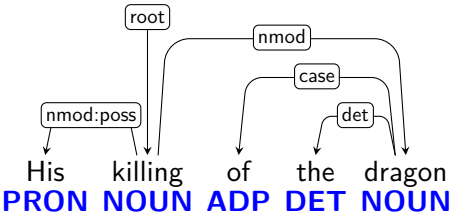
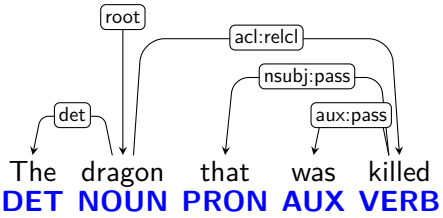
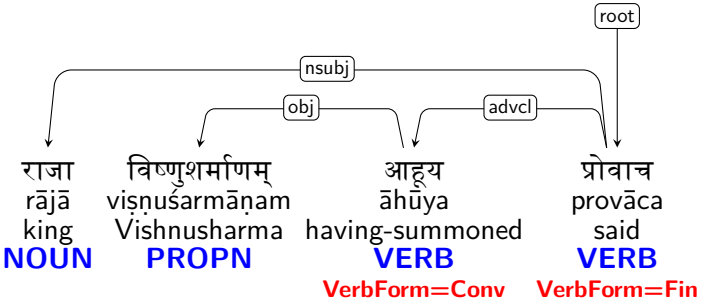




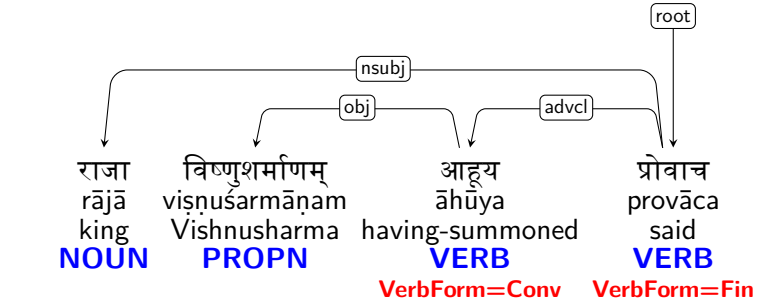




Language-specific Preferences



Language-specific Preferences



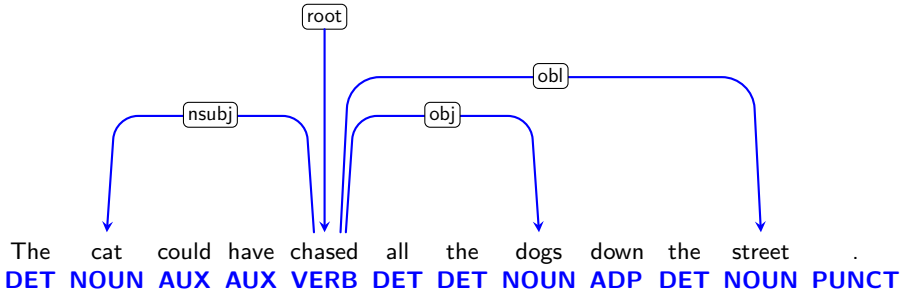
Syntax Tour

Outline

Syntax

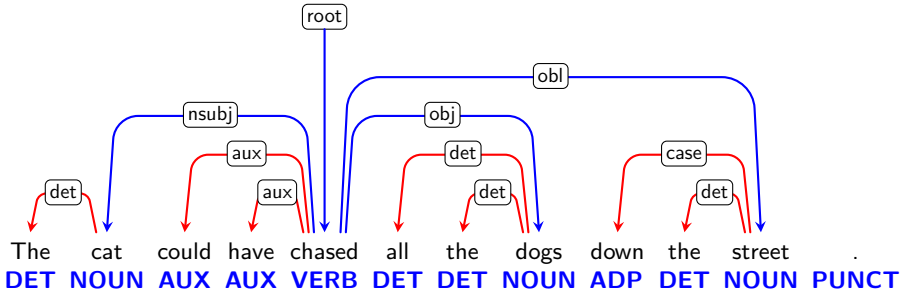
The	cat	could	have	chased	all	the	dogs	down	the	street	.
DET	**NOUN**	**AUX**	**AUX**	**VERB**	**DET**	**DET**	**NOUN**	**ADP**	**DET**	**NOUN**	**PUNCT**

Syntax



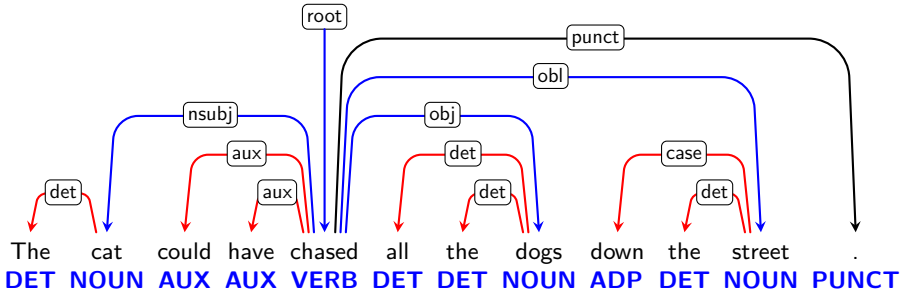
- Content words are related by dependency relations

Syntax



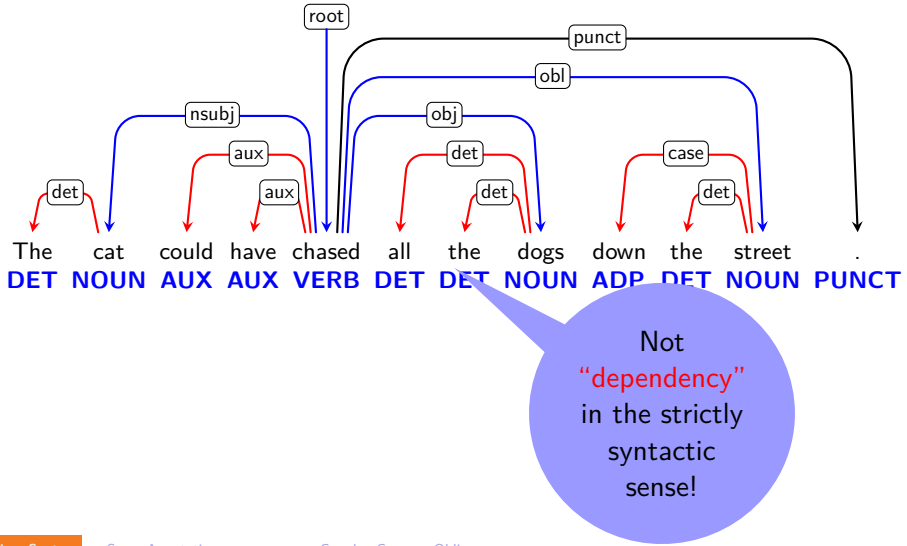
- Content words are related by dependency relations
- Function words attach to closest content words

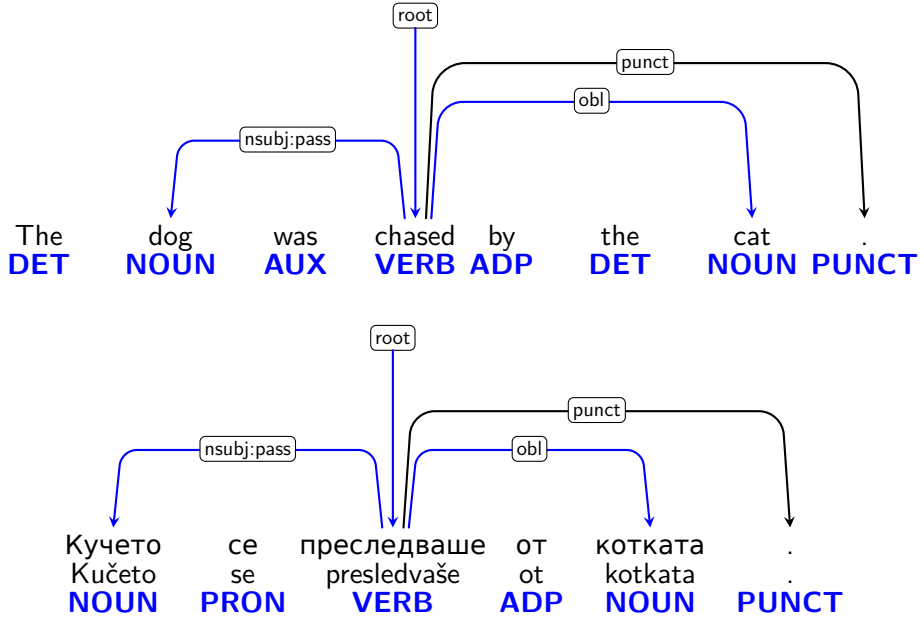
Syntax

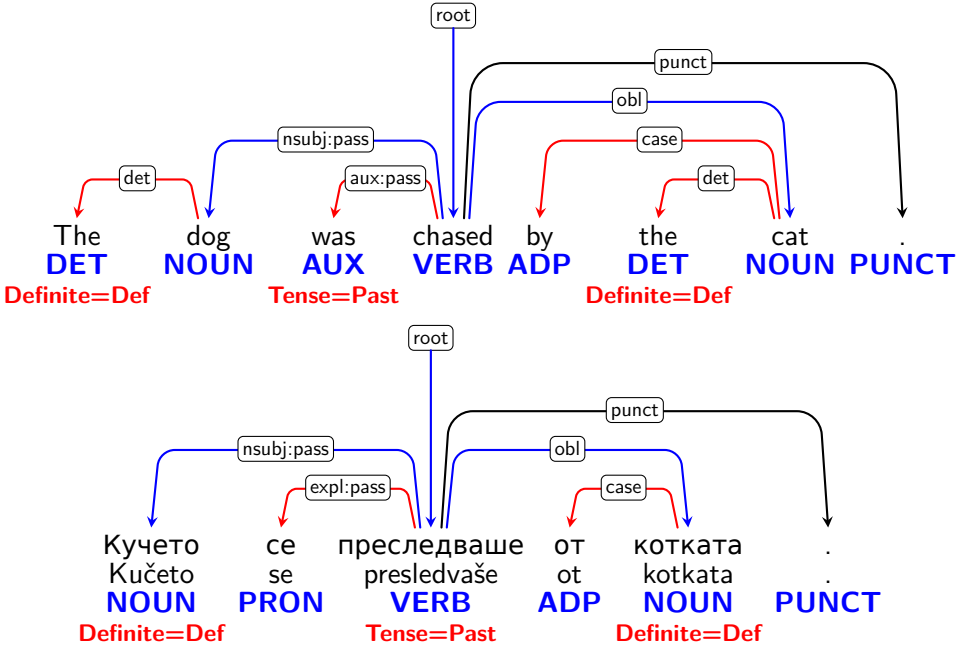


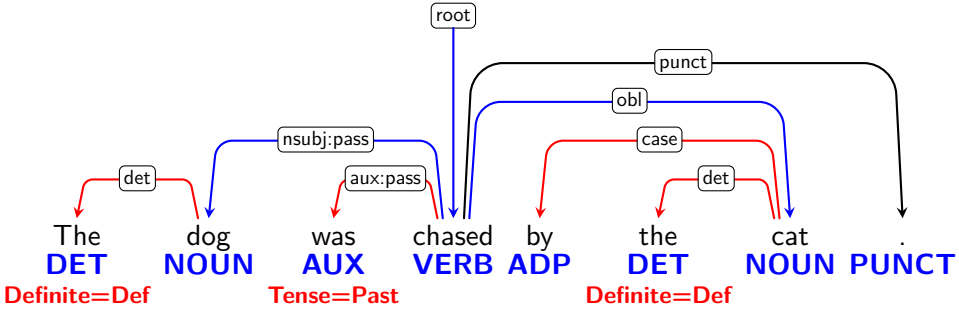
- Content words are related by dependency relations
- Function words attach to closest content words
- Punctuation attach to head of phrase or clause

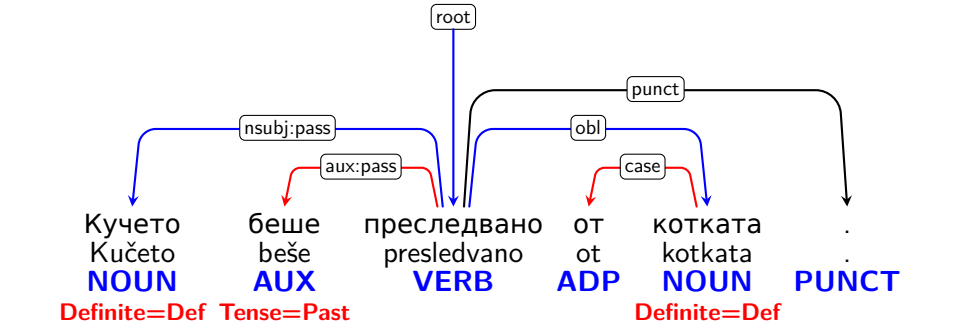
Syntax


root
punct
obl
nsubj
obj
aux
det
case
det
aux
det
det
The cat could have chased all the dogs down the street .
DET NOUN AUX AUX VERB DET DET NOUN ADP DET NOUN PUNCT
Not "dependency" in the strictly syntactic sense!


root
punct
obl
nsubj:pass
The dog was chased by the cat .
DET NOUN AUX VERB ADP DET NOUN PUNCT
root
punct
nsubj:pass
obl
Кучето се преследваше от котката .
Kučeto se presledvaše ot kotkata .
NOUN PRON VERB ADP NOUN PUNCT


root
punct
obl
nsubj:pass
case
det
aux:pass
det
The dog was chased by the cat .
DET NOUN AUX VERB ADP DET NOUN PUNCT
Definite=Def Tense=Past Definite=Def
root
punct
nsubj:pass
obl
expl:pass
case
Кучето се преследваше от котката .
Kučeto se presledvaše ot kotkata .
NOUN PRON VERB ADP NOUN PUNCT
Definite=Def Tense=Past Definite=Def


root
punct
obl
nsubj:pass
case
det
aux:pass
det
The dog was chased by the cat .
DET NOUN AUX VERB ADP DET NOUN PUNCT
Definite=Def Tense=Past Definite=Def


root
punct
nsubj:pass
obl
aux:pass
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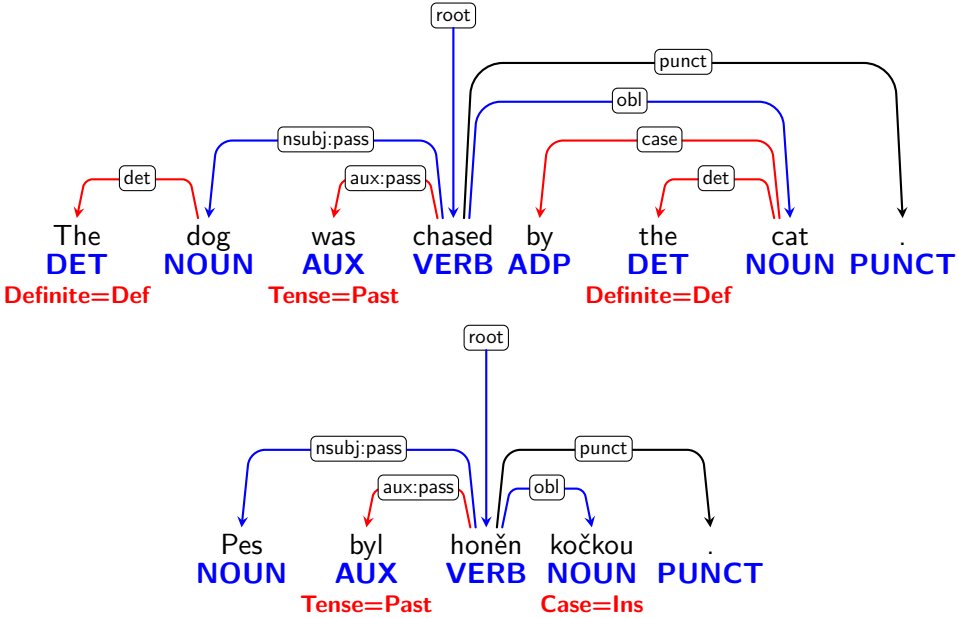
Кучето беше преследвано от котката .
Kučeto beše presledvano ot kotkata .
NOUN AUX VERB ADP NOUN PUNCT
Definite=Def Tense=Past Definite=Def


root
punct
obl
nsubj:pass
case
det
aux:pass
det
The dog was chased by the cat .
DET NOUN AUX VERB ADP DET NOUN PUNCT
Definite=Def
Tense=Past
Definite=Def
root
nsubj:pass
punct
aux:pass
obl
Pes byl honěn kočkou .
NOUN AUX VERB NOUN PUNCT
Tense=Past
Case=Ins

Dependents of Clauses (Verbal or Not)

	Nominal	Clausal	Modifier	Function
Core	**nsubj**	csubj		
Non-Core	**obl**	advcl	advmod	aux
	vocative		discourse	cop
	dislocated			mark
	expl			

Dependents of Verbs, Adjectives and Adverbs

	Nominal	Clausal	Modifier
Core	**obj**	ccomp	
	iobj	xcomp	
Non-Core	**obl**	advcl	advmod
	expl		

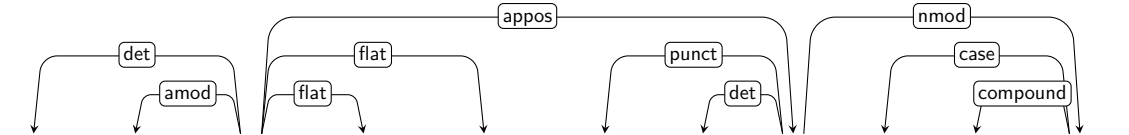
Dependents of Nominals

Nominal	Clausal	Modifier	Function
nmod	acl	amod	det
appos		nummod	case

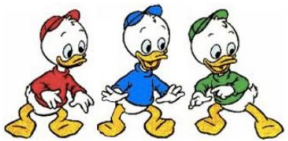
Noun Phrase

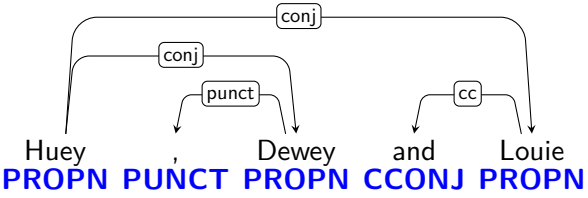
Dependents of Nominals

Nominal	**Clausal**	**Modifier**	**Function**
nmod	acl	amod	det
appos		nummod	case
compound			clf
flat			



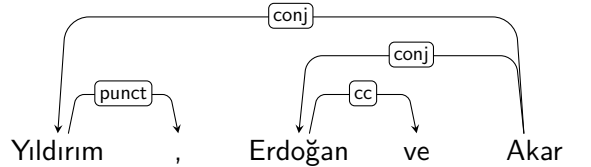
Coordination





- Coordinate structures are headed by the first conjunct
  - Subsequent conjuncts depend on it via the conj relation
  - Conjunctions depend on the next conjunct via the cc relation
  - Punctuation marks depend on the next conjunct via the punct relation

But Some Languages Might Prefer the Opposite



- Coordinate structures would be headed by the last conjunct
  - Preceding conjuncts would depend on it via the conj relation
  - Conjunctions would depend on the preceding conjunct
  - Punctuation marks would depend on the preceding conjunct

Multiword Expressions

Relation	Examples
fixed	*as well, by and large, according to, more than*
flat	*president Havel, New York, four thousand*
compound	*phone book, dress up*
goeswith	*notwith standing, with out*

- UD annotation almost does not permit "words with spaces"
  - Multiword expressions are analyzed using special relations
  - The fixed, flat and goeswith relations are always head-initial
  - The compound relation reflects the internal structure
- Words with spaces allowed in exceptional cases:
  - Vietnamese (spaces delimit syllables, not words)
  - Numbers ("1 000 000")
  - Possibly other approved cases, e.g. multi-word abbreviations

Other Relations

Other Relations

Relation	Explanation
parataxis	Loosely linked clauses of same rank
list	Lists without syntactic structure
orphan	Orphans in ellipsis linked together
reparandum	Disfluency linked to (speech) repair
dep	Unspecified dependency
root	The single syntactically independent element of the sentence

Language-specific Relation Subtypes

- Language-specific relations are subtypes of universal relations added to capture important phenomena
- Subtyping permits us to "back off" to universal relations

Language-specific Relation Subtypes

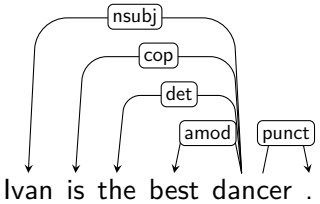
Relation	Explanation
acl:relcl	Relative clause (the boy who lived)
compound:prt	Verb particle (dress up)
nmod:poss	Possessive nominal (Mary 's book)
obl:agent	Agent in passive (saved by the bell)
cc:preconj	Preconjunction (both ... and)
det:predet	Predeterminer (all those ...)

Copula

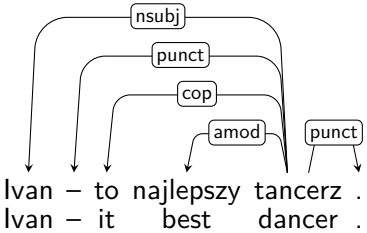
Outline

Nonverbal Predicate and Copula

- Some languages use a copula verb:



- Some languages use a copula pronoun:



Nonverbal Predicate and Copula

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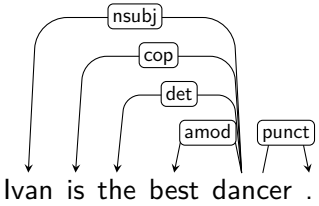
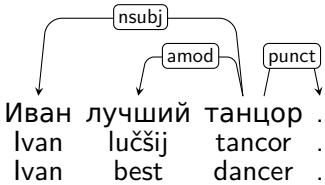


- Some languages omit the copula:



Nonverbal Predicate and Copula

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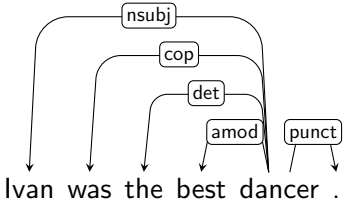
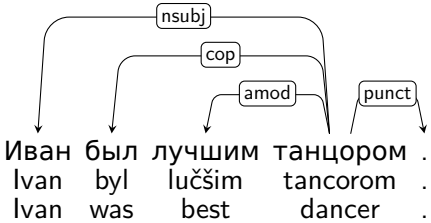
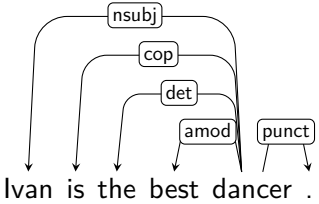


- Some languages use it only in some tenses:

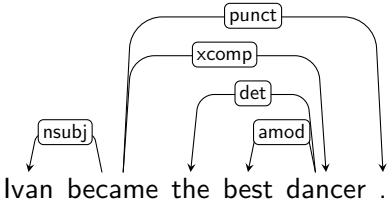


Copula Verbs: We Are Restrictive!

- *To be* is copula:

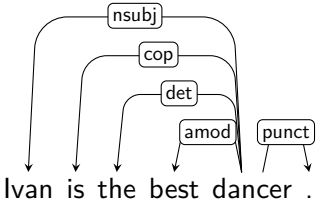


- *To become* is not copula:

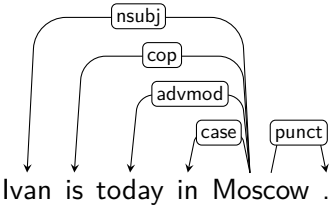


Once Copula, Always Copula!

- This is parallel with Russian:

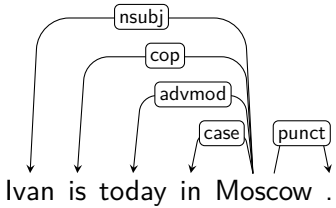


- This is also parallel with Russian:

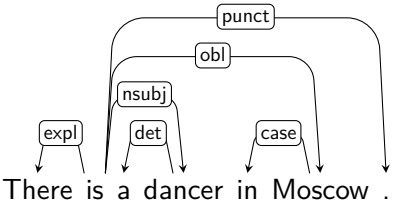


Well, Almost...

- This is parallel with Russian:

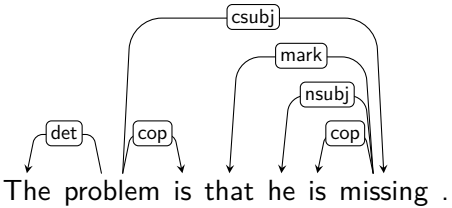


- But not with this in English:

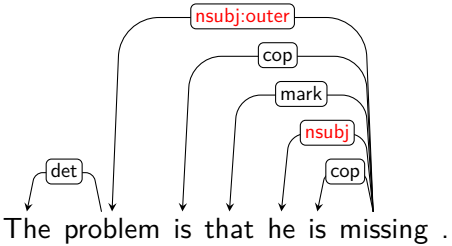


Clauses and Copula

- A clause can be the subject:



- A clause can be the nonverbal predicate:



Core vs. Oblique

Outline

Dependents of Clauses (Verbal or Not)

	Nominal	Clausal	Modifier	Function
Core	**nsubj**	csubj		
Non-Core	**obl**	advcl	advmod	aux
	vocative		discourse	cop
	dislocated			mark
	expl			

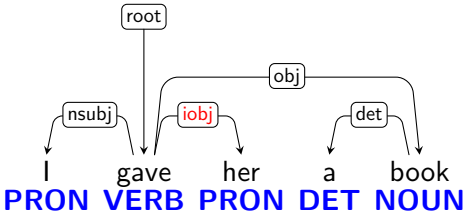
Dependents of Verbs, Adjectives and Adverbs

	Nominal	Clausal	Modifier
Core	**obj**	ccomp	
	iobj	xcomp	
Non-Core	**obl**	advcl	advmod
	expl		

Dependents of Nominals

Nominal	Clausal	Modifier	Function
nmod	acl	amod	det
appos		nummod	case

Information Packaging



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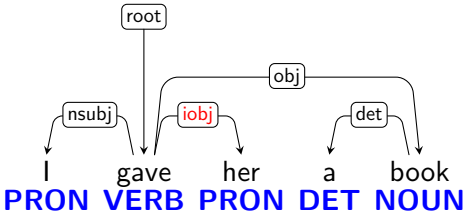

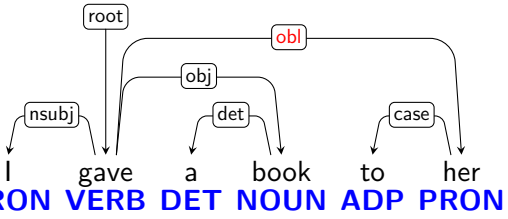

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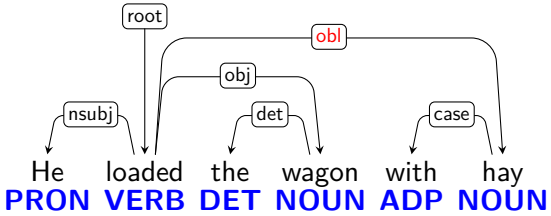

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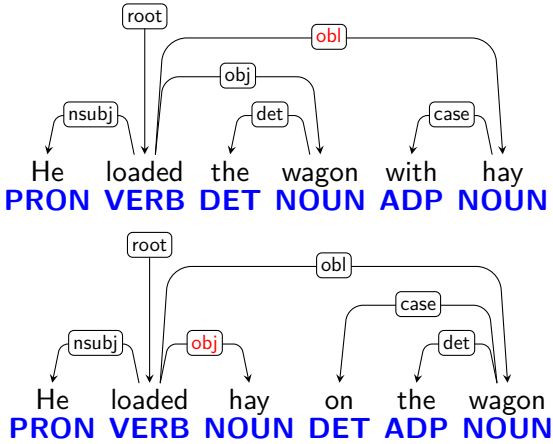
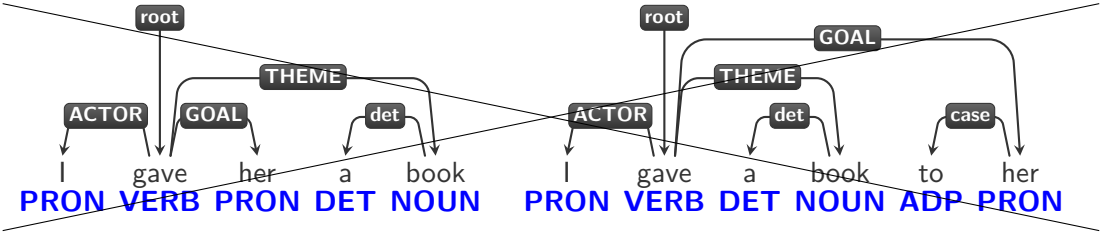


UD is NOT about Semantic Roles!



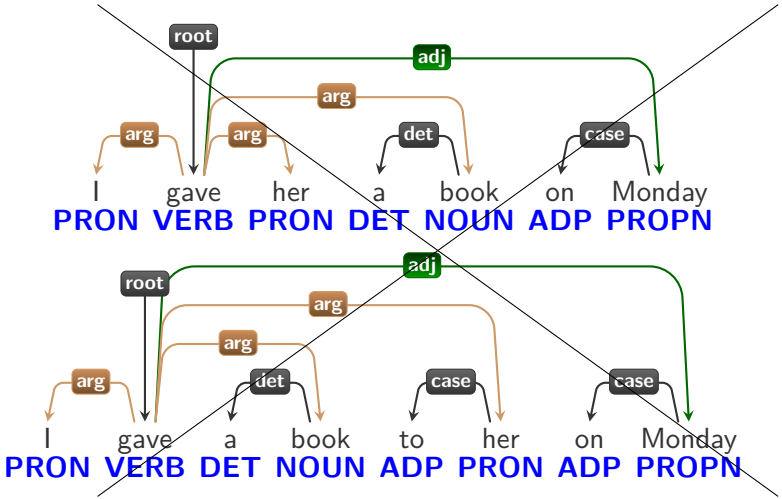
Manning's Law – What If We Do Semantic Roles?

The secret to understanding the design and current success of UD is to realize that the design is a very subtle compromise between approximately 6 things:

1. UD must be satisfactory on linguistic analysis grounds for individual languages.
2. UD must be good for linguistic typology, i.e., providing a suitable basis for bringing out cross-linguistic parallelism across languages and language families.
3. UD must be suitable for rapid, consistent annotation by a human annotator.
4. UD must be easily comprehended and used by a non-linguist, whether a language learner or an engineer with prosaic needs for language processing. … it leads us to favor traditional grammar notions and terminology.
5. UD must be suitable for computer parsing with high accuracy.
6. UD must support well downstream language understanding tasks (relation extraction, reading comprehension, machine translation, …)

It's easy to come up with a proposal that improves UD on one of these dimensions. The interesting and difficult part is to improve UD while remaining sensitive to all these dimensions.

UD Avoids Argument-Adjunct Distinction!



Avoiding an Argument-Adjunct Distinction

- From the guidelines:
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- AND I will show that
  - Core-oblique distinction is not completely clear either
  - (Though I will not propose to discard it.)

So What Is Core and Why?

Community Confusion

- UD v1 guidelines took core-oblique for granted
- English (simplified):
  - Bare noun phrase ⇒ core argument (`nsubj`, `obj`, `iobj`)
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- Clash with traditional terminology
  - Grammars of German, Czech etc. define prepositional objects
  - But these are not necessarily core...
  - Yet some people took their national definition of object...

Language-specific Coding Strategy

- Idea:
  - Oblique arguments are marked similarly to adjuncts (prepositions, certain morphological cases...)
  - Core arguments are marked differently
    - $\Rightarrow$ easy for annotators and non-linguists!

- Why are core arguments special?
  - They tend to be targeted by grammatical rules
    - Passivization
    - Control verbs
    - Reflexives
    - ...

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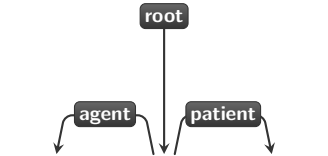
  - Then define:
    - function A ⇒ `nsubj`
    - function P ⇒ `obj`

Transitive Predicates in English



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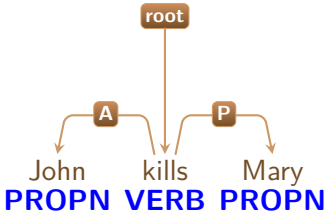

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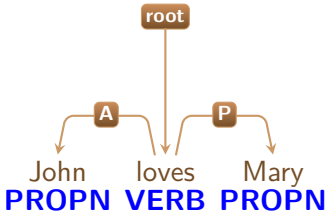

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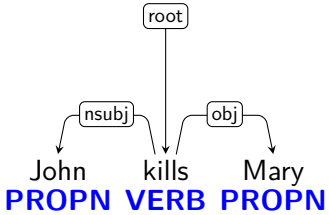

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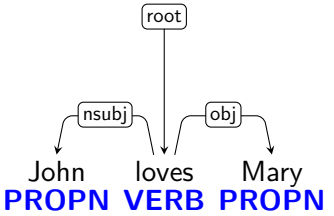

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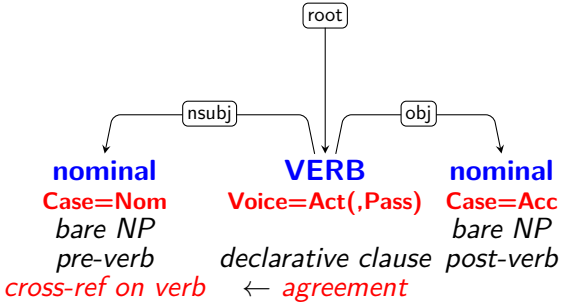
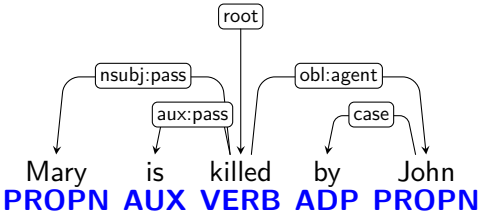
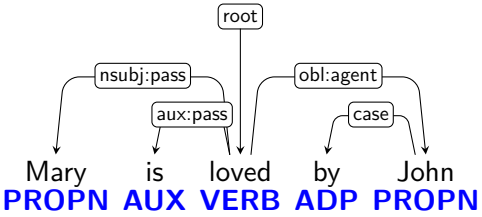
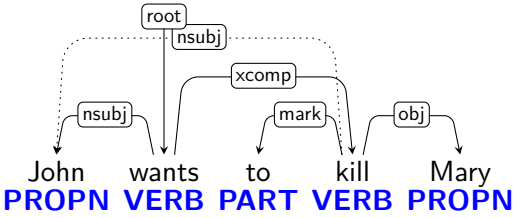


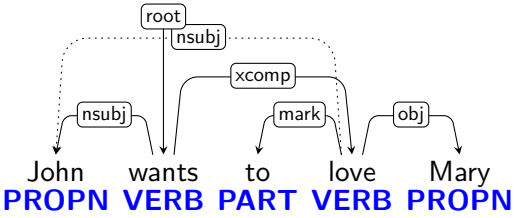
Passivization in English



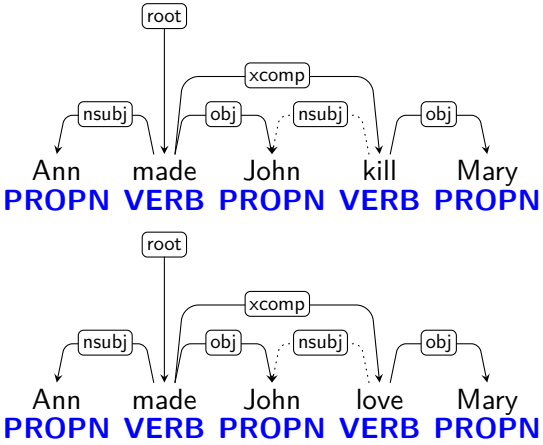


Subject Control in English



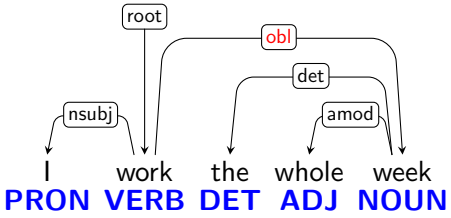


Object Control in English



Some Problems

- Some temporal adjuncts are bare noun phrases
  - *I work the whole week.*
  - *I work every Friday.*



- At least it cannot passivize:
  - **The whole week is worked by me.*
  - **Every Friday is worked by me.*
- But...

Some Problems

- Some transitive verbs cannot passivize
  - *John has a new car.*
    - **A new car is had by John.*
  - *Friday does not suit me.*
    - **I am not suited by Friday.*

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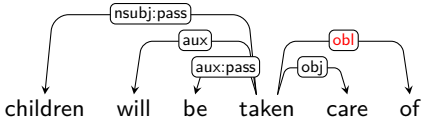
- Some prepositional verbs can passivize
  - *You can rely on Ben.*
    - *Ben can be relied on.*
  - *They will take care of your children.*
    - *Your children will be taken care of.*



Bare Temporal Adjuncts: Any Other Criteria?

- *I work the whole week.*
- *I work every Friday.*

- English has a fixed word order; adjuncts are less fixed than objects:
  - *I work every Friday in Paris.*
  - *I work in Paris every Friday.*
  - *I spend every Friday in Paris.*
  - **I spend in Paris every Friday.*

- Unlike objects, adjuncts cannot be replaced by pronouns:
  - *Where do you spend this Friday? I spend it in Paris.*
  - *Where do you work this Friday? *I work it in Paris.*

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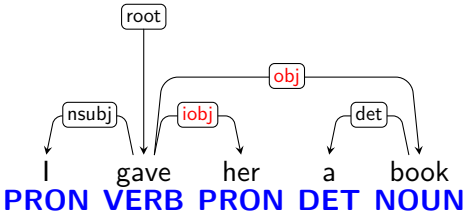
- Semantic roles needed when starting a new language
- Argument-adjunct might help with exceptions
  - Although we managed to explain *the whole week* without it

Intransitive Predicates

- Just one core argument
  - We already "know" how to find out if there are two
- ⇒ function S
  - Regardless of semantic role:
    - *John runs.*
    - *John sleeps.*
    - *John falls.*
    - *John relies on me.* … intransitive because *on me* is not a core argument!
- Then define:
  - function S ⇒ `nsubj`

Ditransitive Predicates

- Three core arguments: `nsubj`, `obj`, and `iobj`
- Which one is `iobj`? Language-specific rules. English: the one closer to the verb (i.e., the GOAL semantic role).
- **NEW in 2023:** `iobj` can be used even if `obj` is not present



- Passivization:
  - *She was given a book by me.*
  - *?A book was given her by me.*

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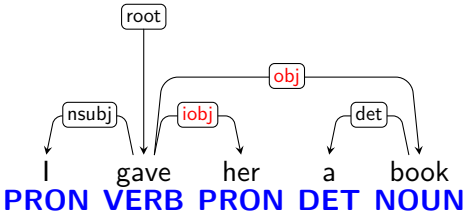

- Fronting in questions:
  - *What did I give her?*
  - **Who did I give a book?*

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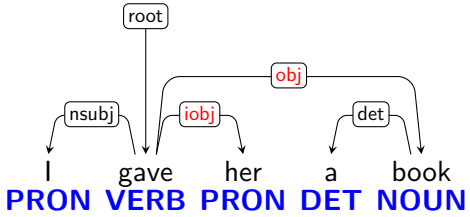
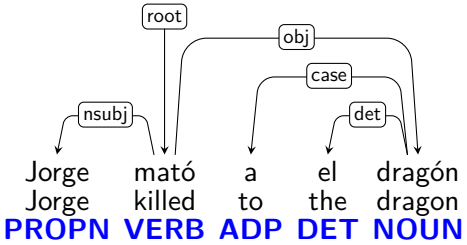
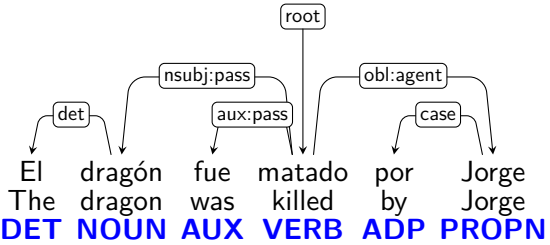
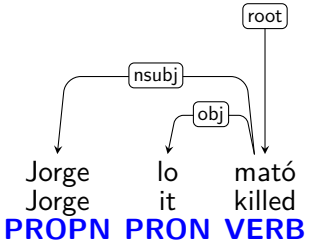


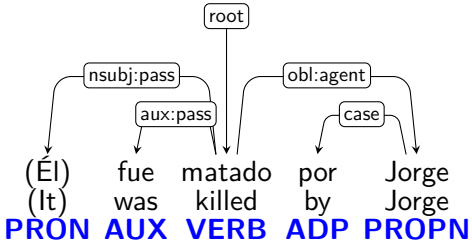
- Andrews (2007): *the status of the notion of 'indirect object' is problematic and difficult to sort out. The top priority is to work out what properties recipients and themes do and do not share with P arguments of primary transitive verbs.*

Spanish

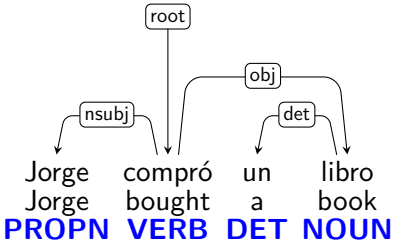

root
obj
case
nsubj
det
Jorge mató a el dragón
Jorge killed to the dragon
PROPN VERB ADP DET NOUN

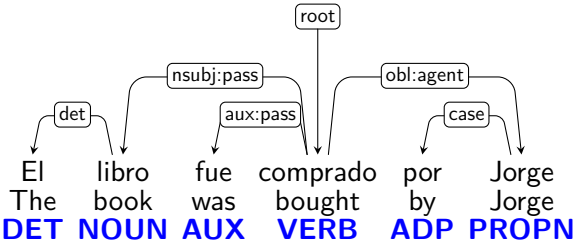

root
nsubj:pass
obl:agent
det
aux:pass
case
El dragón fue matado por Jorge
The dragon was killed by Jorge
DET NOUN AUX VERB ADP PROPN

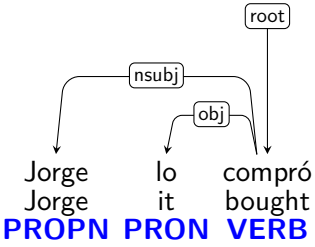

root
nsubj
obj
Jorge lo mató
Jorge it killed
PROPN PRON VERB

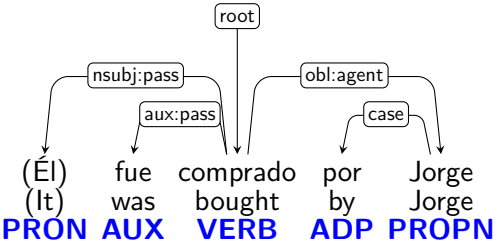

root
nsubj:pass
obl:agent
aux:pass
case
(Él) fue matado por Jorge
(It) was killed by Jorge
PRON AUX VERB ADP PROPN

Spanish

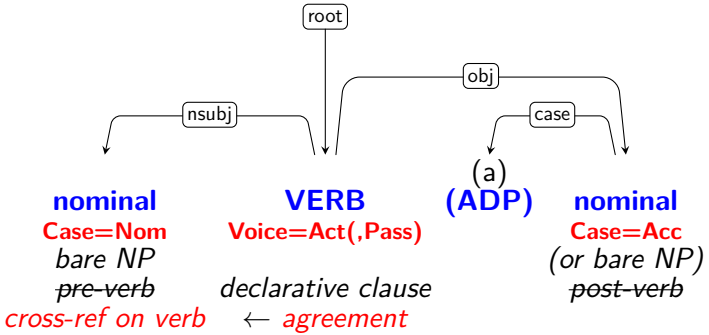

root
obj
nsubj
det
Jorge compró un libro
Jorge bought a book
PROPN VERB DET NOUN


root
nsubj:pass
obl:agent
det
aux:pass
case
El libro fue comprado por Jorge
The book was bought by Jorge
DET NOUN AUX VERB ADP PROPN

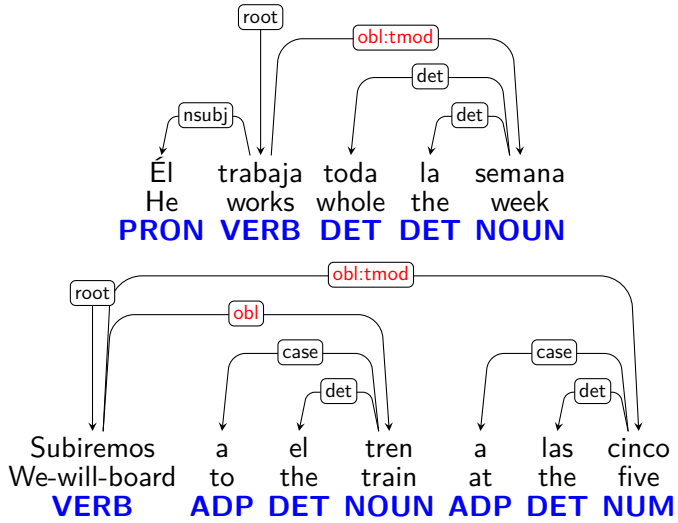

root
nsubj
obj
Jorge lo compró
Jorge it bought
PROPN PRON VERB


root
nsubj:pass
obl:agent
aux:pass
case
(Él) fue comprado por Jorge
(It) was bought by Jorge
PRON AUX VERB ADP PROPN

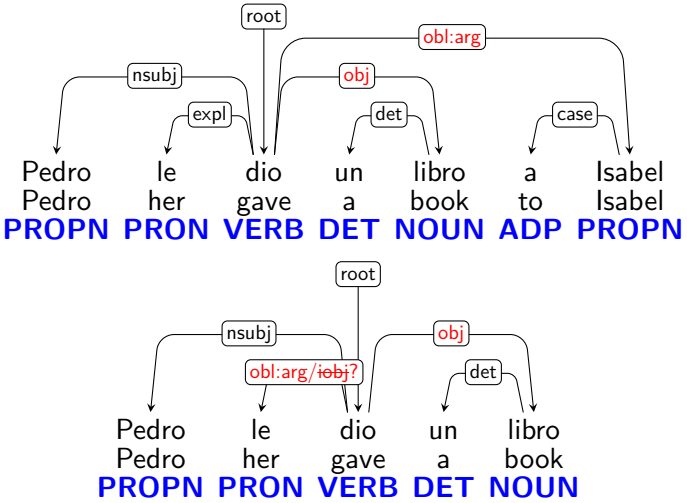
Spanish Transitive Clauses



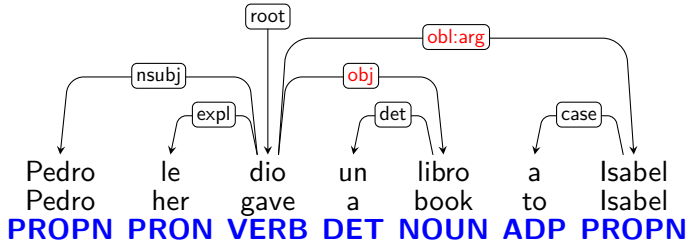
Spanish Adjunct Exceptions



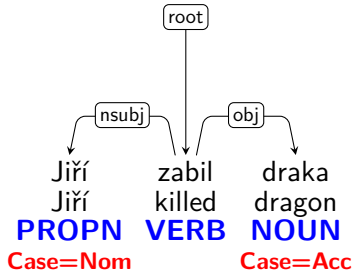
Spanish Ditransitive Clauses

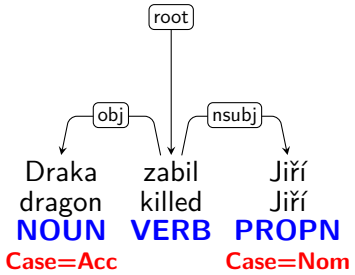


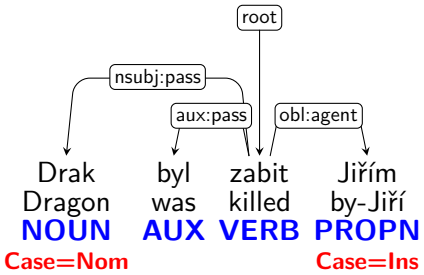
Spanish Ditransitive Clauses

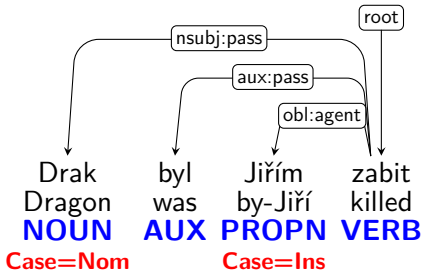


Czech


root
nsubj
obj
Jiří
Jiří
PROPN
Case=Nom
zabil
killed
VERB
draka
dragon
NOUN
Case=Acc


root
obj
nsubj
Draka
dragon
NOUN
Case=Acc
zabil
killed
VERB
Jiří
Jiří
PROPN
Case=Nom


root
nsubj:pass
aux:pass
obl:agent
Drak
Dragon
NOUN
Case=Nom
byl
was
AUX
zabit
killed
VERB
Jiřím
by-Jiří
PROPN
Case=Ins


root
nsubj:pass
aux:pass
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Drak
Dragon
NOUN
Case=Nom
byl
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AUX
Jiřím
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PROPN
Case=Ins
zabit
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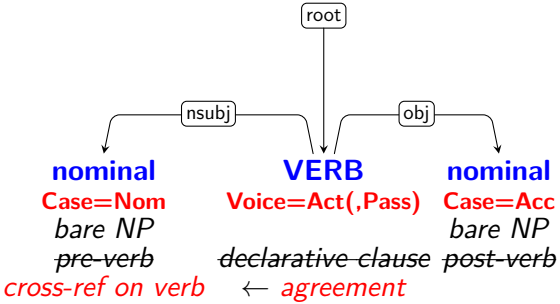
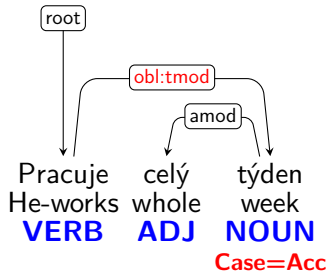
VERB

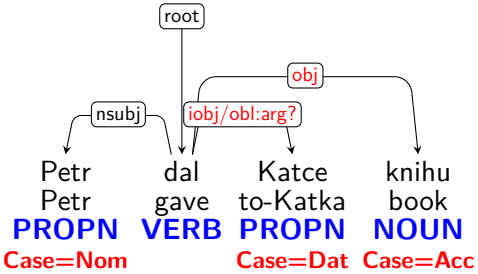
Czech Transitive Clauses

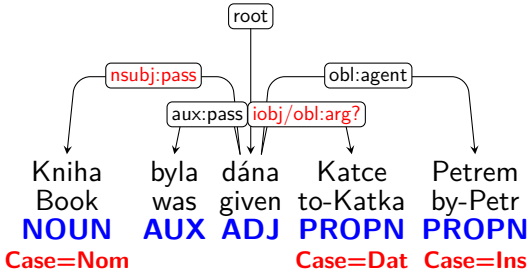


Czech Adjunct Exceptions

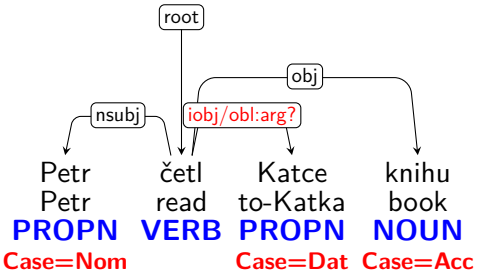


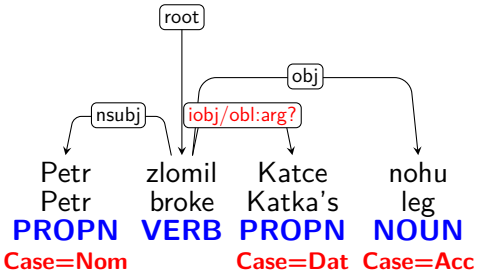
Czech Ditransitive Clauses



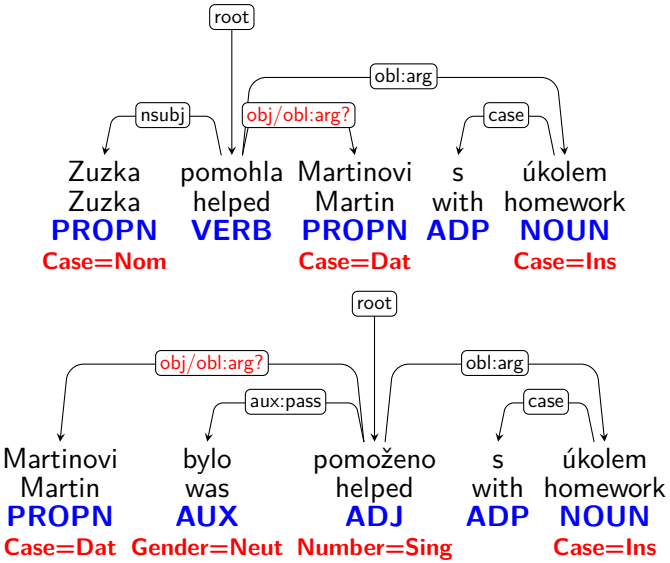


Dative: Recipient vs. Beneficiary

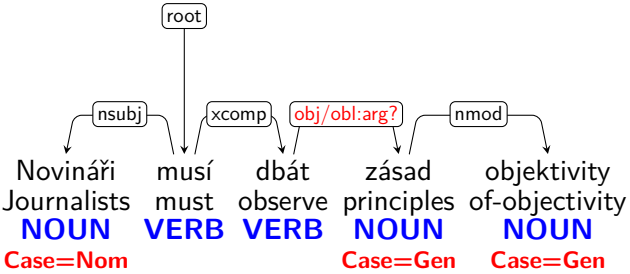




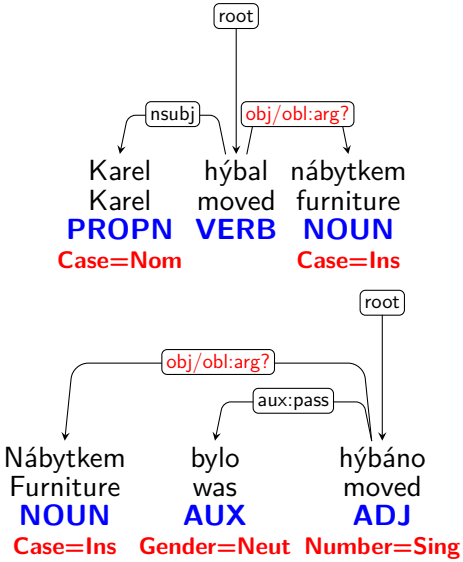
Monotransitive with Dative?



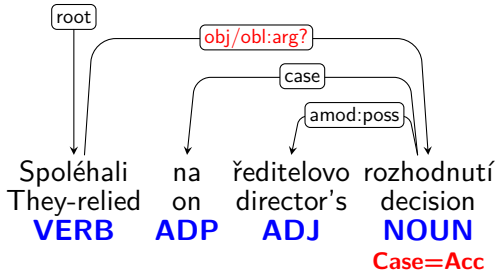
Monotransitive with Genitive?

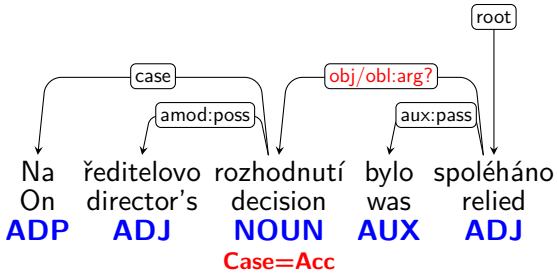


Monotransitive with Instrumental?



Monotransitive with Preposition?





Tentative Summary 2

- There is a core-oblique scale:
- **Nom** > **Acc** > **Gen,Dat** > **Ins** > **preposition**

- Where is the borderline?

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- UD Czech 2.6 (May 2020):
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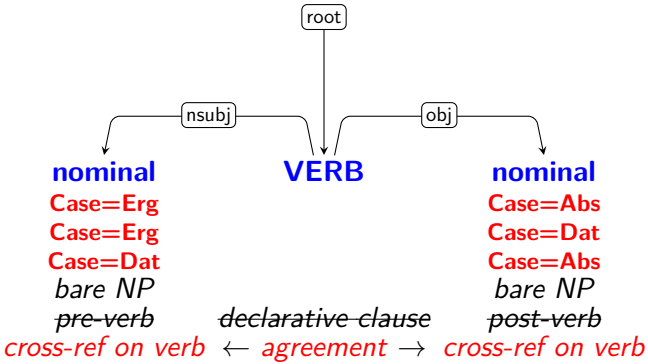
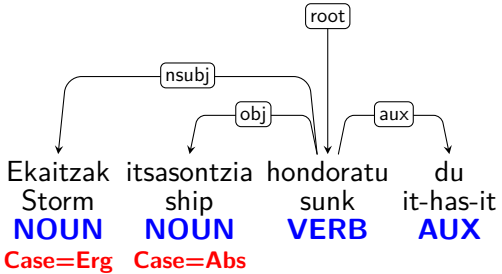
  - ⇒ No ditransitives in Czech!
  - (Exception: *učit* "to teach" takes two Acc.)

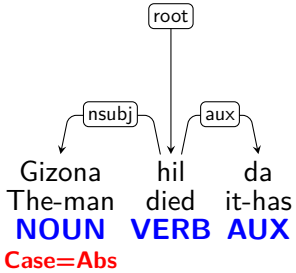
Basque Transitive Clauses



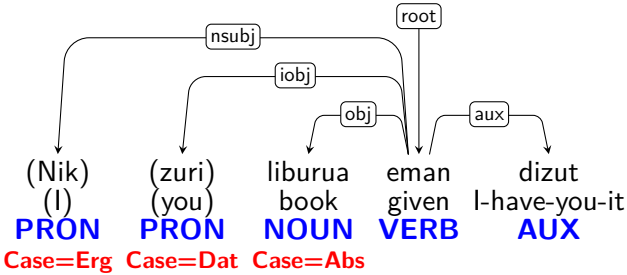
Basque Transitive Clauses



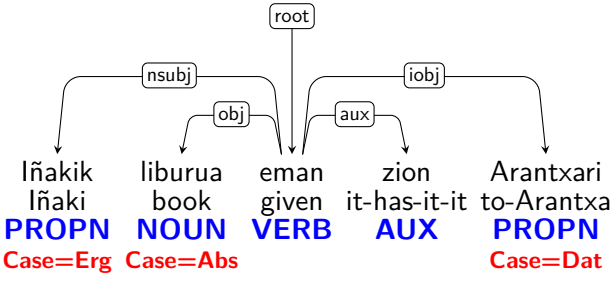
Basque Intransitive Clauses



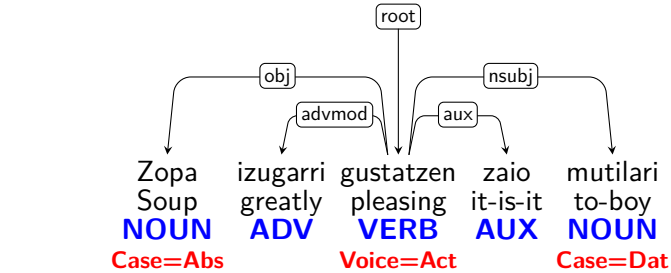
Basque Ditransitive Clauses



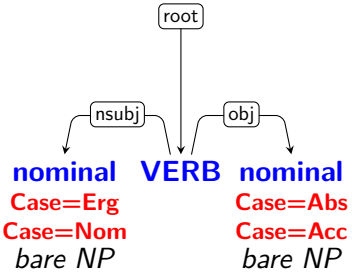
Basque Ditransitive Clauses



Basque Causative Applied to Dative Subject

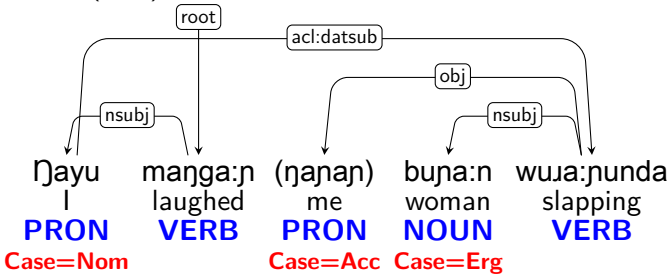


Yidiɲ Transitive Clauses



Yidiɲ “Dative” Adnominal Clauses

“I, (who) was slapped by the woman, laughed”



Yidiɲ “Dative” Adnominal Clauses

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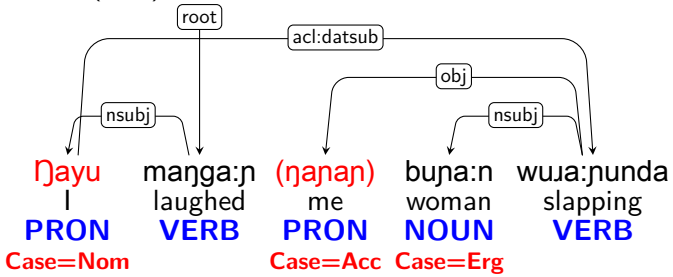
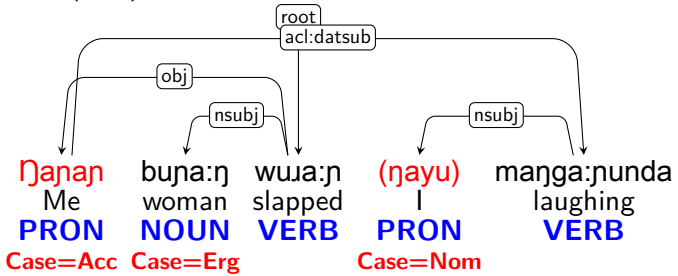


The coreferential (and elidable) NP must have S or P function.

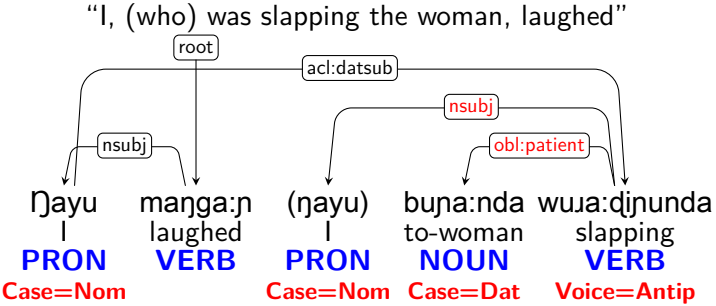
Yidiɲ “Dative” Adnominal Clauses

“I, (who) was lauging, was slapped by the woman”



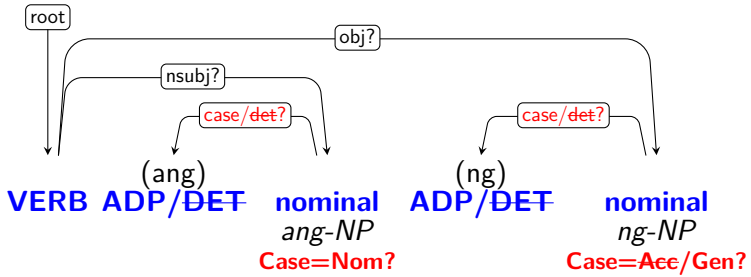
The coreferential (and elidable) NP must have S or P function.

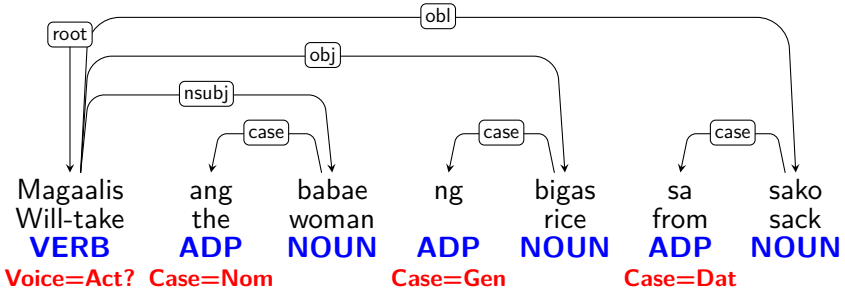
Yidiɲ **Antipassive**



Original P is now oblique and original A is now S.

Tagalog Transitive Clauses




root
obl
obj
nsubj
case
case
case
Magaalis
Will-take
VERB
Voice=Act?
ang
the
ADP
Case=Nom
babae
woman
NOUN
ng
ADP
Case=Gen
bigas
rice
NOUN
sa
from
ADP
Case=Dat
sako
sack
NOUN
root
obl
nsubj:pass
obj:agent
case
case
case
Aalisin
Will-take
VERB
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ng
ADP
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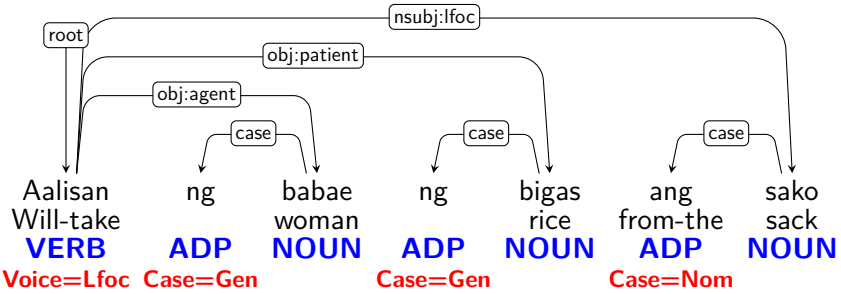
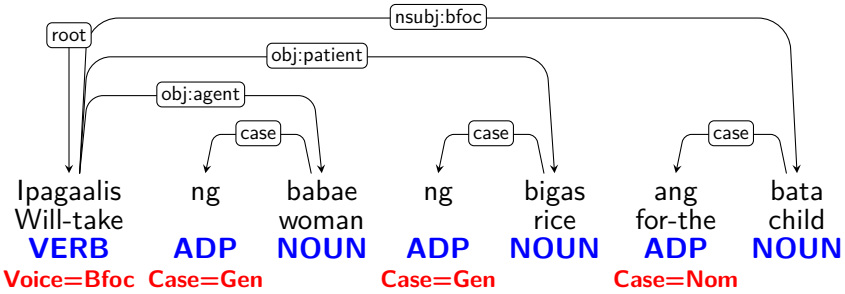
woman
NOUN
ang
the
ADP
Case=Nom
bigas
rice
NOUN
sa
from
ADP
Case=Dat
sako
sack
NOUN

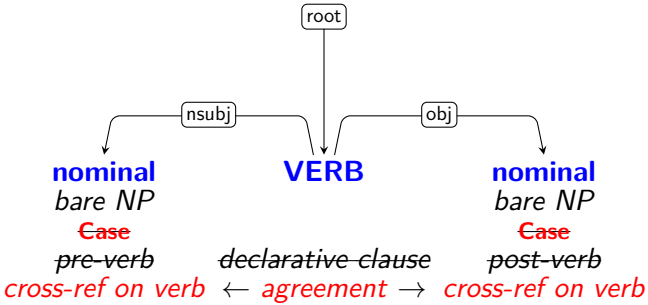
Tagalog Locative Voice ⇒ Ditransitive!



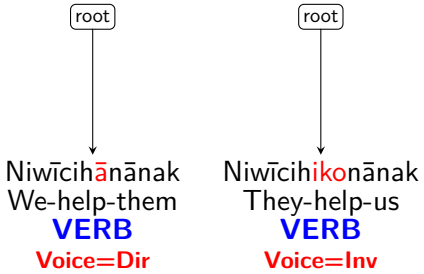
Tagalog Benefactive Voice ⇒ Ditransitive!



Plains Cree Transitive Clauses

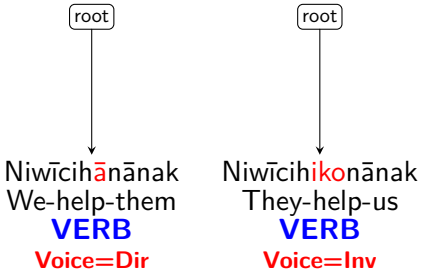


Direct-Inverse Voice in Plains Cree



Animacy hierarchy: 1st person > 3rd person

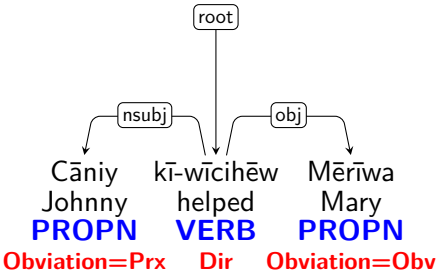
Direct-Inverse Voice in Plains Cree

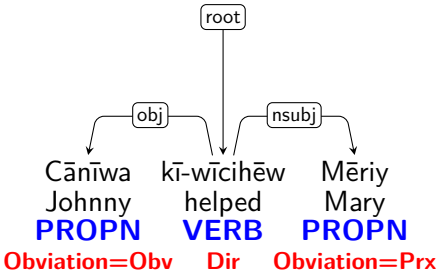


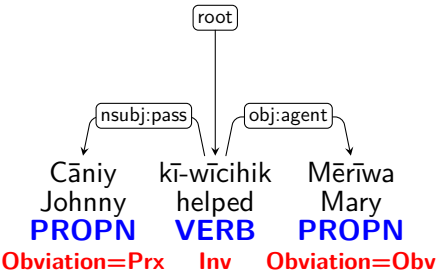
Animacy hierarchy: 1st person > 3rd person

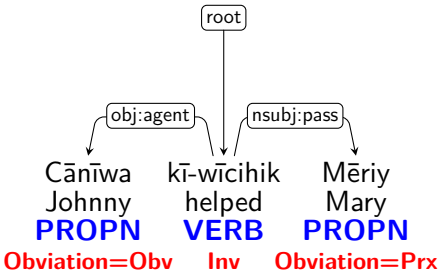
Should we set `nsubj` > `obj`?

Direct-Inverse Voice in Plains Cree

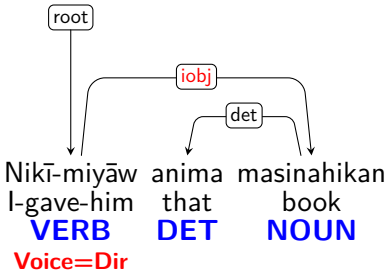








Plains Cree Ditransitive Clauses



The theme (not the recipient) is indirect object because it is not cross-referenced on the verb (it is inanimate, while the verb references an animate object).

Summary

- Universal Dependencies
  - Unified annotation for all languages
    - Language-specific extensions
  - Content words higher than function words … better parallelism
  - Clauses – nominals – modifier words
  - Core arguments vs. oblique dependents

https://ufal.mff.cuni.cz/courses/dz-2026-07-bh