A Computational Grammar for Georgian

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Outline

1. Introduction: The Georgian grammar project
2. Lexical-Functional Grammar
3. Morphology and Morphosyntax
4. Some aspects of Georgian syntax
5. Tools for LFG grammar development

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- uses XLE (Xerox Linguistic Environment) as a parsing engine
- uses visualization, treebanking and corpus tools developed at Aksis/University of Bergen
- is part of the international Parallel Grammar (ParGram) project, which coordinates the development of LFG grammars in a parallel manner using XLE

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- constraint-based; no transformations
- rigid formalism, well-suited for implementation and efficient parsing, as well as for theoretical work

C- and F-structure

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- Lexical items (lemmas and morphological features) are annotated with a lexical category and functional equations (including argument structures for verbs)

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children they-play.

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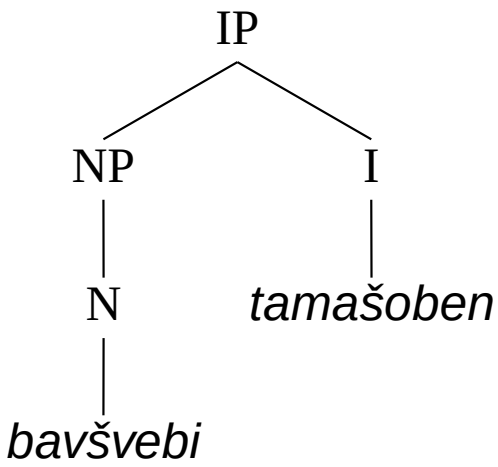

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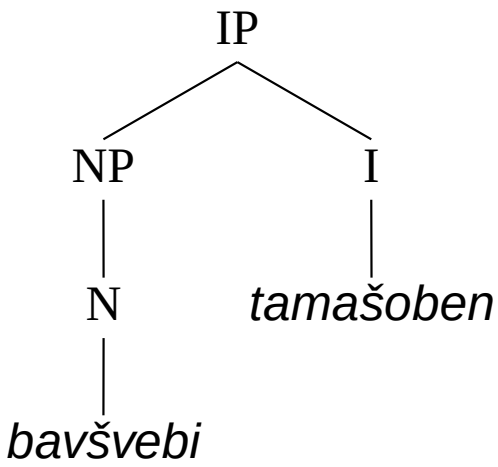

f-structure

$$\begin{bmatrix} \text{PRED } \text{'tamaši<[1:bavšvi]>'} \\ \text{SUBJ } {}_{1}\begin{bmatrix} \text{PRED } \text{'bavšvi'} \\ \text{CASE nom} \\ \text{NUM pl} \end{bmatrix} \\ \text{TNS-ASP } \begin{bmatrix} \text{TENSE pres} \\ \text{ASPECT imperf} \\ \text{MOOD indicative} \end{bmatrix} \end{bmatrix}$$

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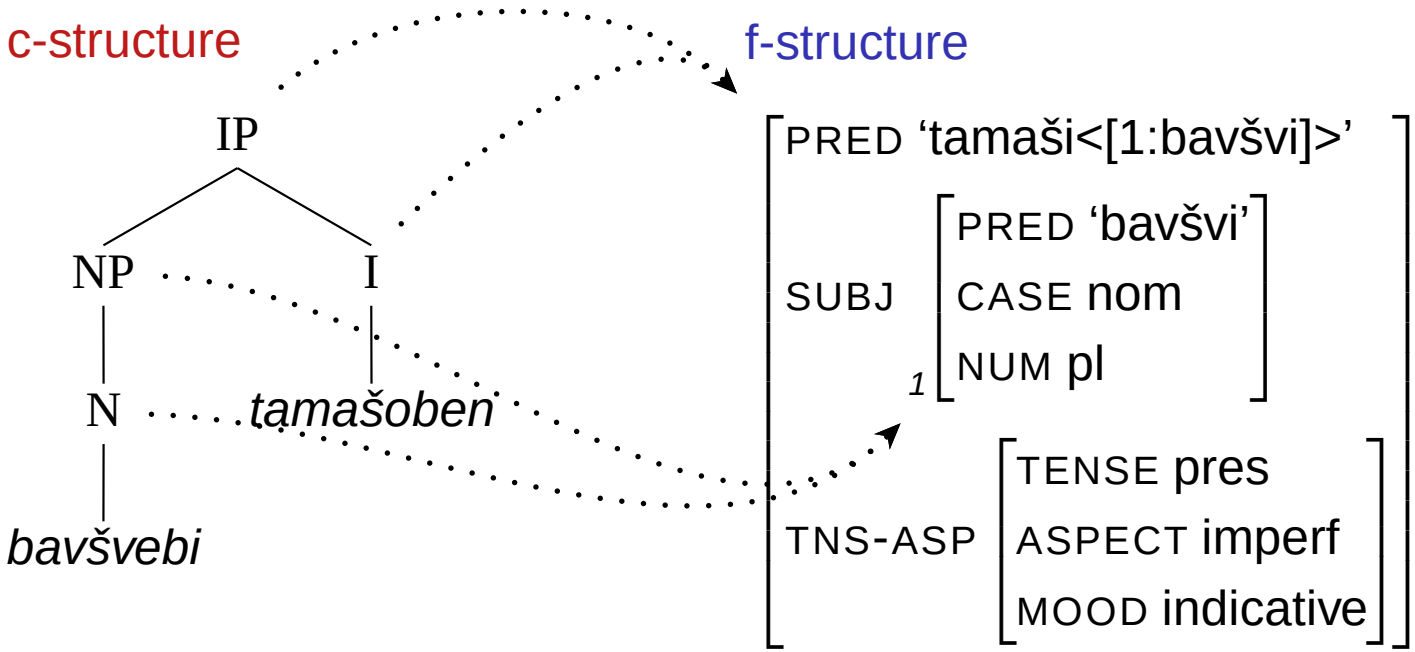

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- Solving of functional equations

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‘I apparently painted it’/‘he will paint it for me’
da-mi-xaṭ-av-s →

{ da-xaṭva-3569-5+V+Trans+Perf+Subj1Sg+Obj3
| da-xaṭva-3569-18+V+Trans+Perf+Subj1Sg+Obj3
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From lexeme to grammatical function

Each verb lexeme in the LFG lexicon is associated with one or more subcategorization frames (argument structures) and a mapping of each of the arguments to a grammatical function (one of SUBJ(ect), OBJ(ect), OBJben(eficiary), OBL(ique), etc.).

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- Example: Tschenkéli's class T^3 maps to the argument structure

  P<SUBJ, OBJben, OBJ>

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- verbs taking clausal arguments
- morphological passives: can be passives or unaccusatives

  ga-ḳet-deba (mtavrobis mier): ‘it will be done (by the government)’
  ga-ḳeteba<OBL-AG, SUBJ>

  *da-brun-deba (*dedis mier)*: ‘(s)he will return’
  da-bruneba<SUBJ>

Case and affix alignment

ṣtudenṭ-ma	ċeril-i	mo-m-ċer-a.
student.ERG	letter.NOM	he-wrote-it-to_me.

The student wrote me a letter.

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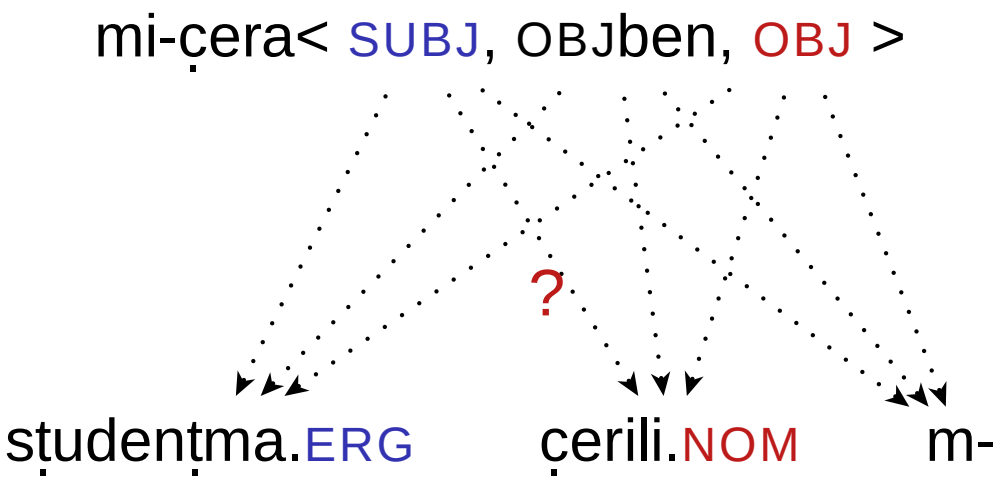

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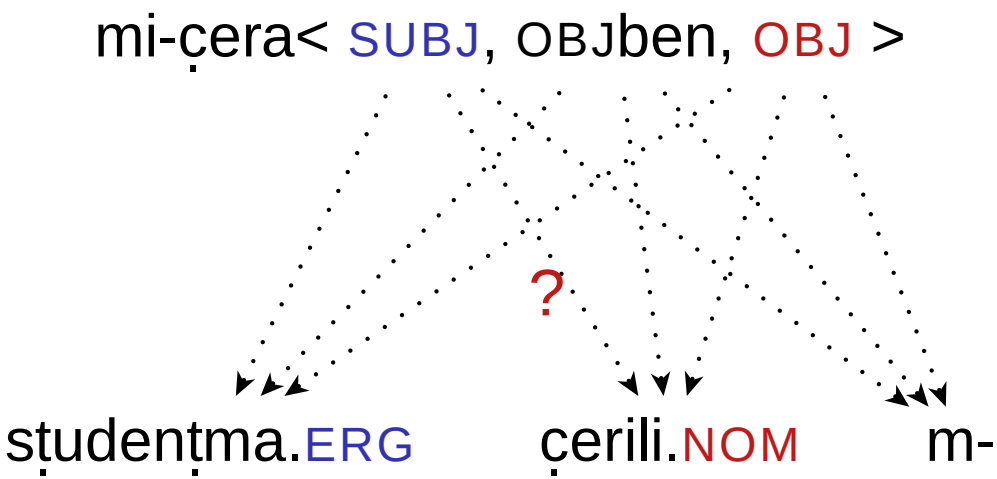

Georgian is head- and dependent-marking: verbal affixes and nominal case code grammatical functions.

Case and affix alignment: Facts

Case alignment patterns

	SUBJ	OBJ	OBJben
A	NOM	DAT	DAT
B	ERG	NOM	DAT
C	DAT	NOM	*-tvis*

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Alignment depending on verb class and tense group

	I *trans.*	II *unacc.*	III *unerg.*	IV *indir.*
present	A	A	A	C
aorist	B	A	B	C
perfect	C	A	C	C

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Person/number affix alignment patterns

	SUBJ	OBJ	OBJben
A = B	*v-* (FSUBJ)	*m-* (FOBJ)	*h-* (FOBJ)
C	*h-* (FOBJ)	*v-* (FSUBJ)	-

Case and affix alignment: Implementation

Affixes: Alignment coded in the morphology

Example: 1st person plural (morphological) subject marker

gv-	→	+FObj1Pl	→	+Subj1Pl (perfect)
			→	+Obj1Pl (otherwise)

ga-gv-i-ḳet-eb-i-a 'we apparently did it'

→ ga-ḳeteba-904-3+V+Perf+FSubj3+FObj1Pl+Trans

→ ga-ḳeteba-904-3+V+Perf+Subj1Pl+Obj3+Trans

Functional equations are attached to morphology features:

+Subj1Pl:	(↑ SUBJ PERS) = 1
	(↑ SUBJ NUM) = pl.
+Obj1Pl:	(↑ _MORPH-SYNT _AGR _OBJ PERS) = 1
	(↑ _MORPH-SYNT _AGR _OBJ NUM) = pl.

Case and affix alignment: Implementation

Case: Alignment coded in the syntax

Equations attached to verb lexicon entry

Example: transitive/unergative subject

{ (↑ SUBJ PRED) = 'pro'
| @(*ifelse* (↑ _TENSEGROUP) $=_c$ pres
[(↑ SUBJ CASE) = nom]
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$\Rightarrow$ First approximation:

$$S \rightarrow V, XP^*$$

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$\Rightarrow$ Revision of phrase structure rules (compliant with Xbar theory, Bresnan 2001):

$I \rightarrow$ finite verb

$I' \rightarrow I\ (S)$

$S \rightarrow XP+$

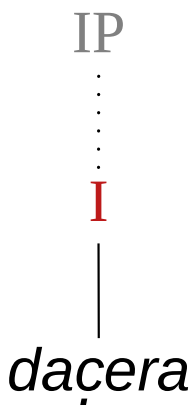
$IP \rightarrow (XP)\ I'$

$IP \rightarrow XP\ IP$

Phrase structure rules

I is the category of the finite (inflected) verb:

I → finite verb



Phrase structure rules

The nonprojective category S is the Complement of I:

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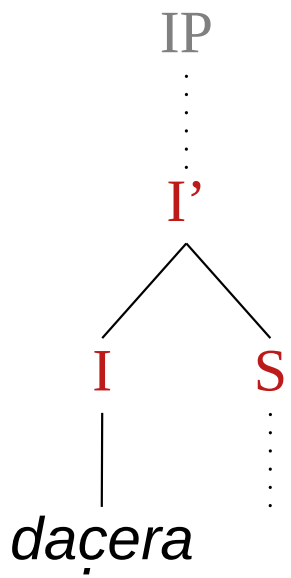

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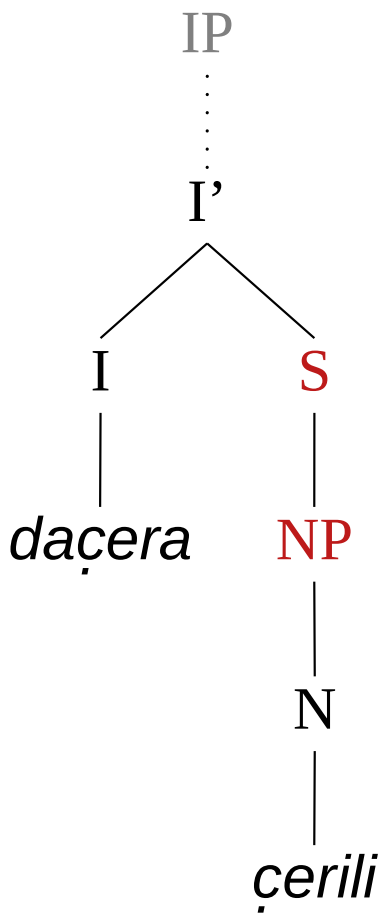

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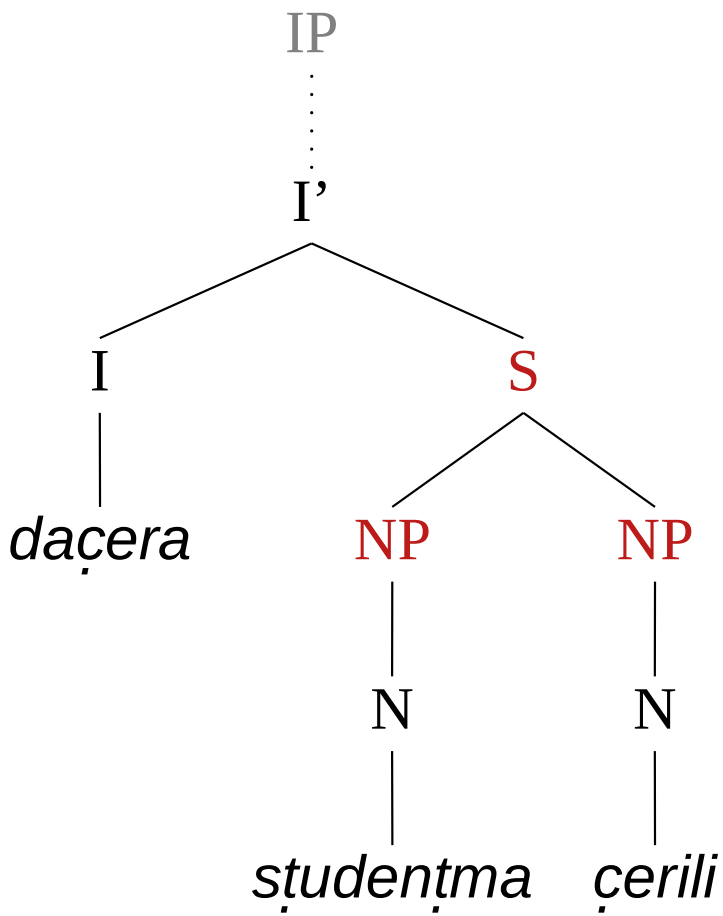
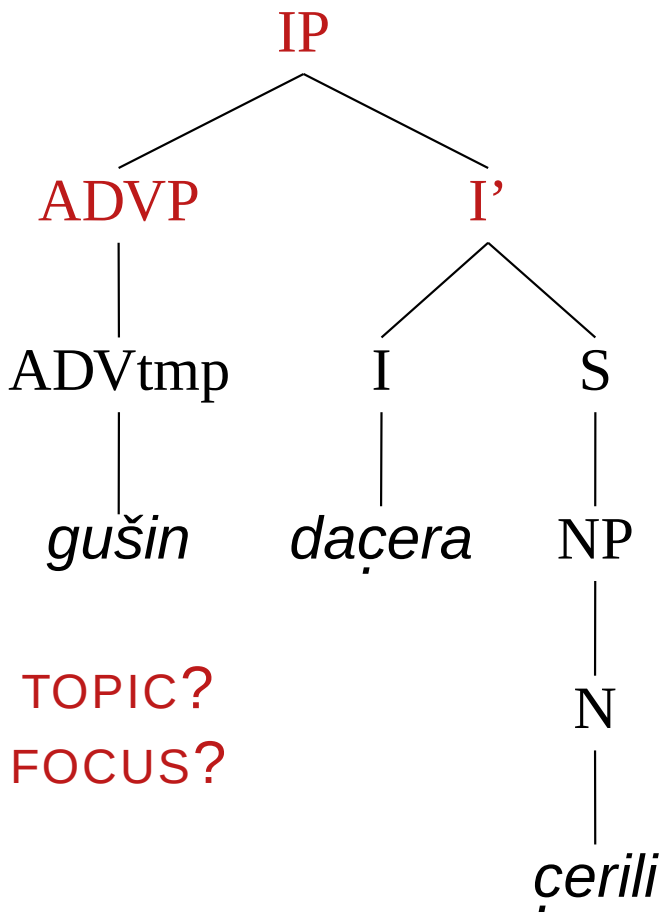


Phrase structure rules

The Specifier of I is often TOPIC or FOCUS position:

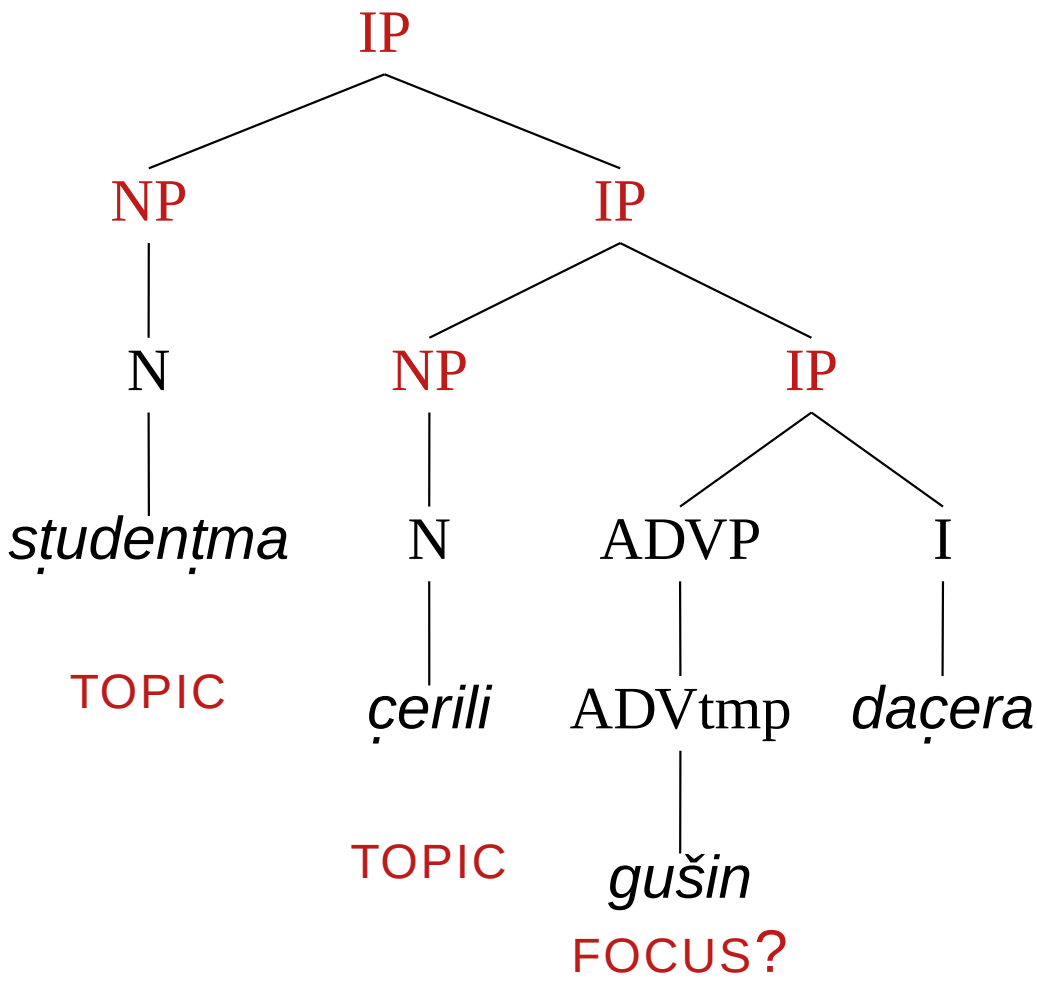
IP → (XP) I'



Phrase structure rules

Material adjoint to IP is TOPIC:

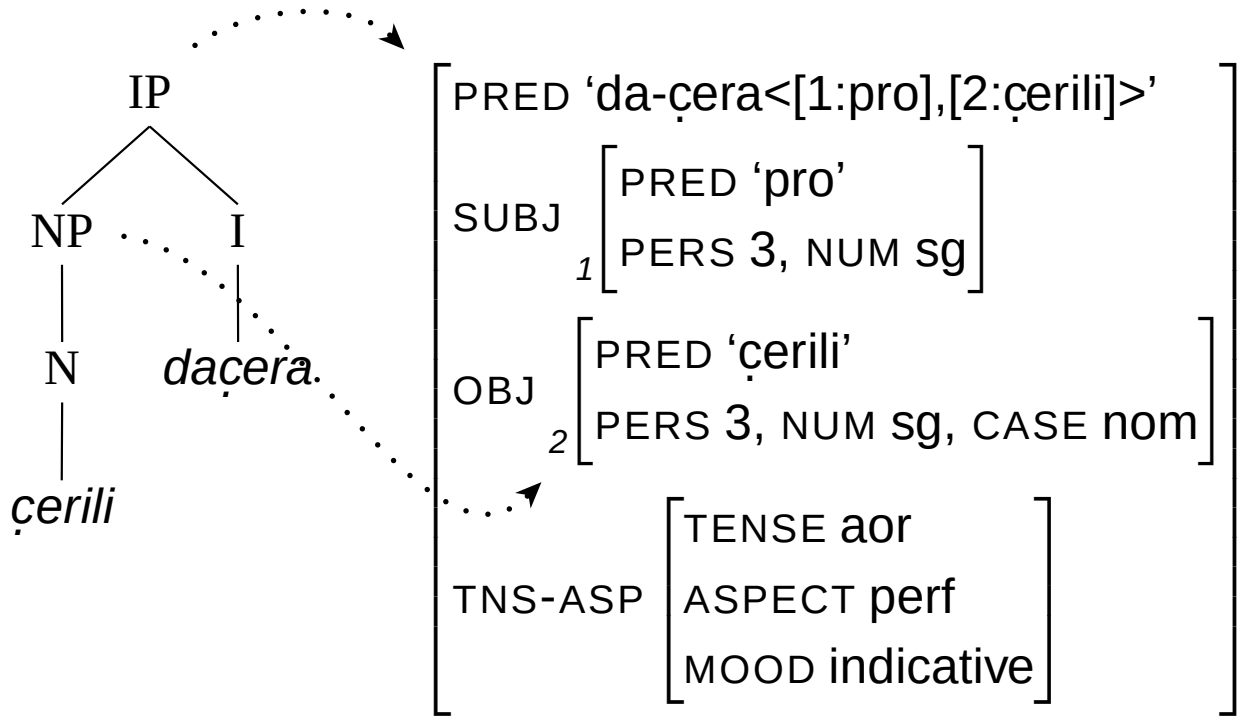
$IP \rightarrow XP\ IP$



Pro-drop and case syntax: Example

ცerili daცera.
letter.NOM he-wrote-it.AOR

'He wrote a letter.'



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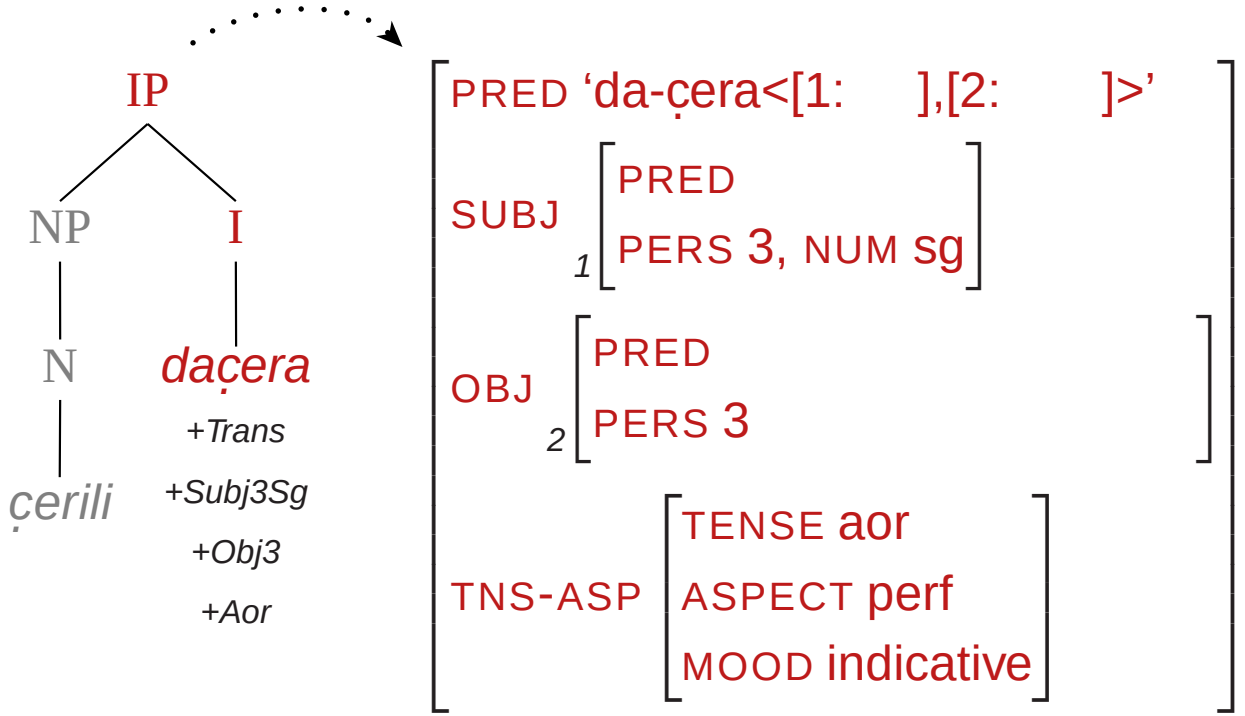

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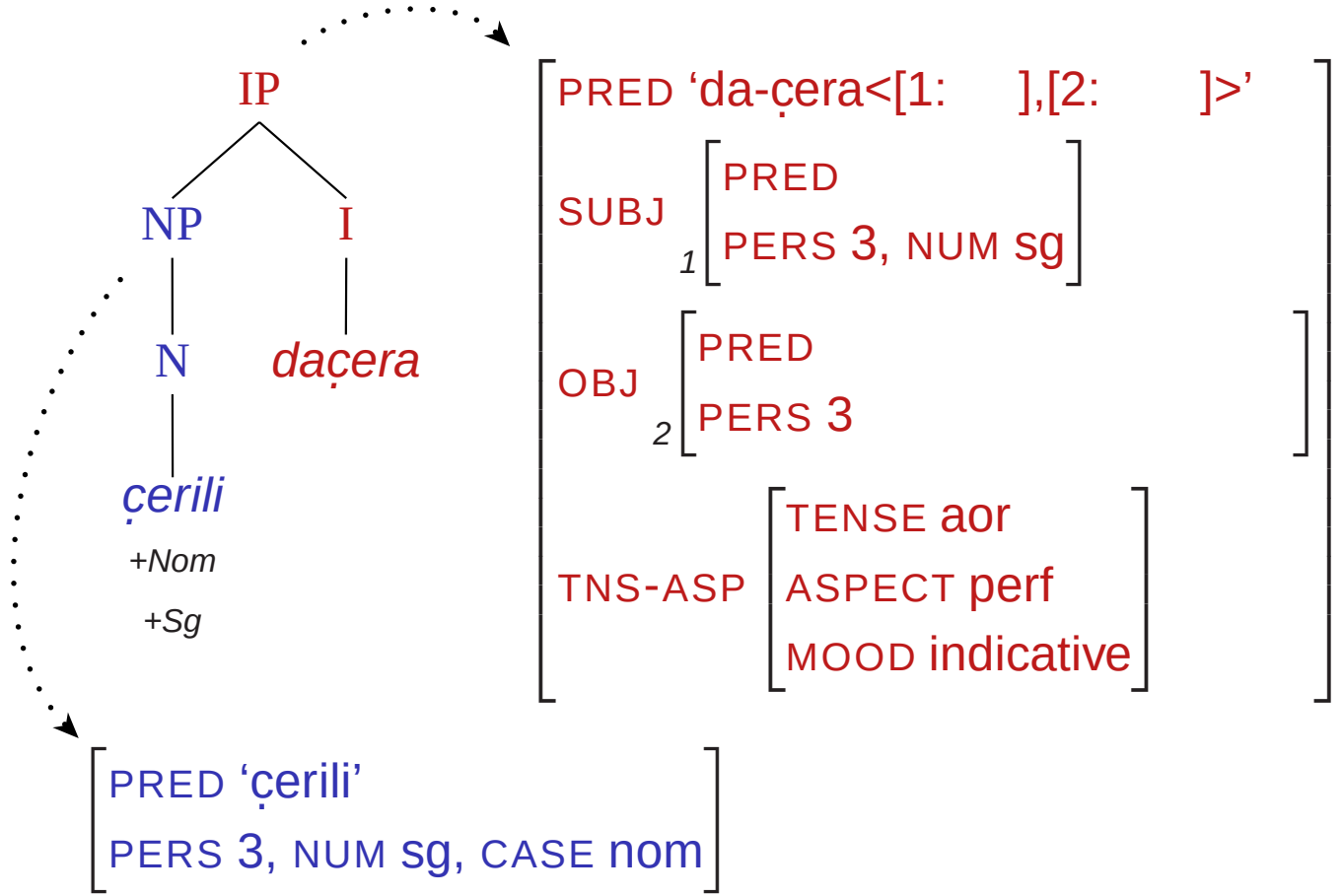

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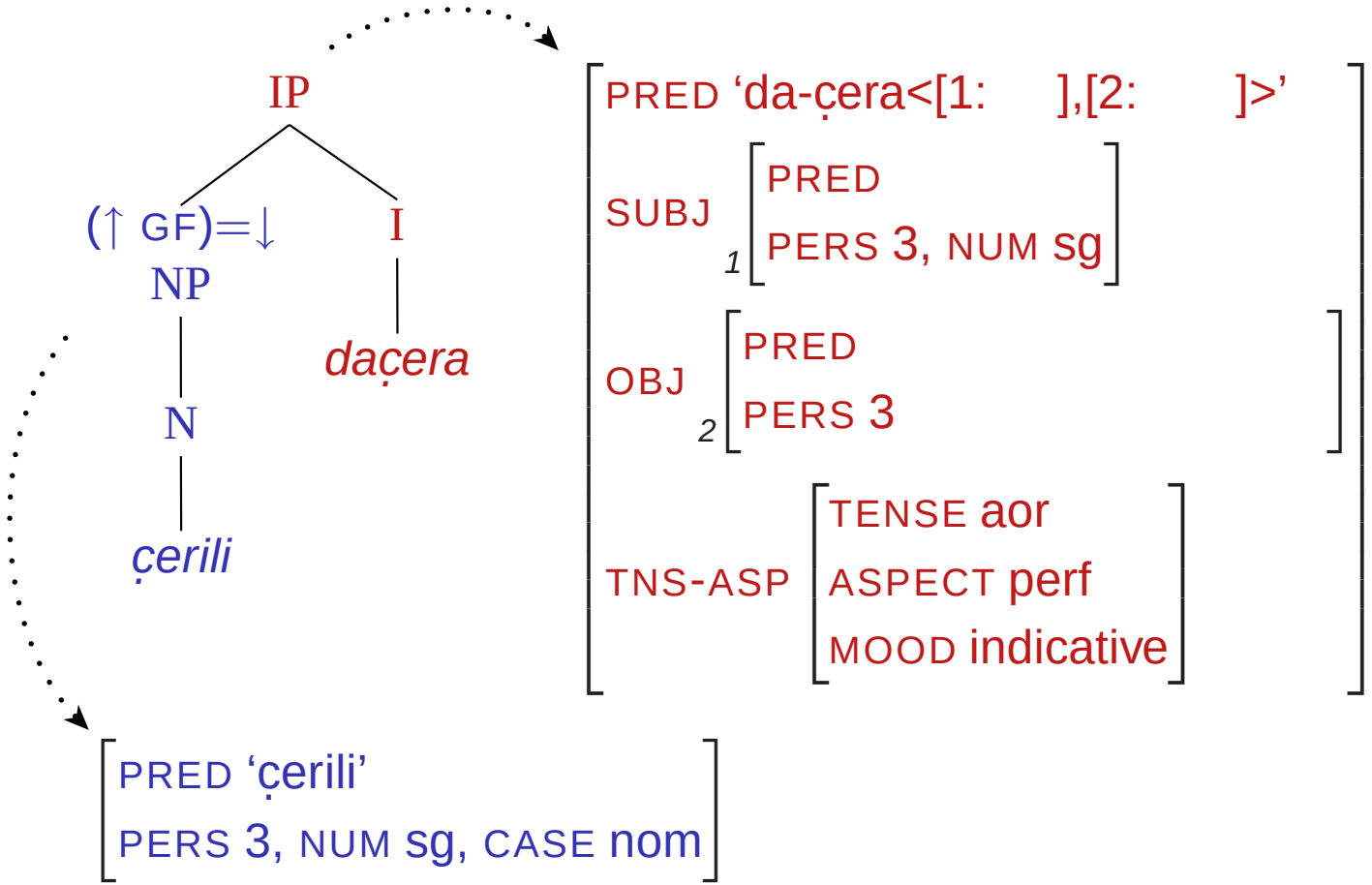

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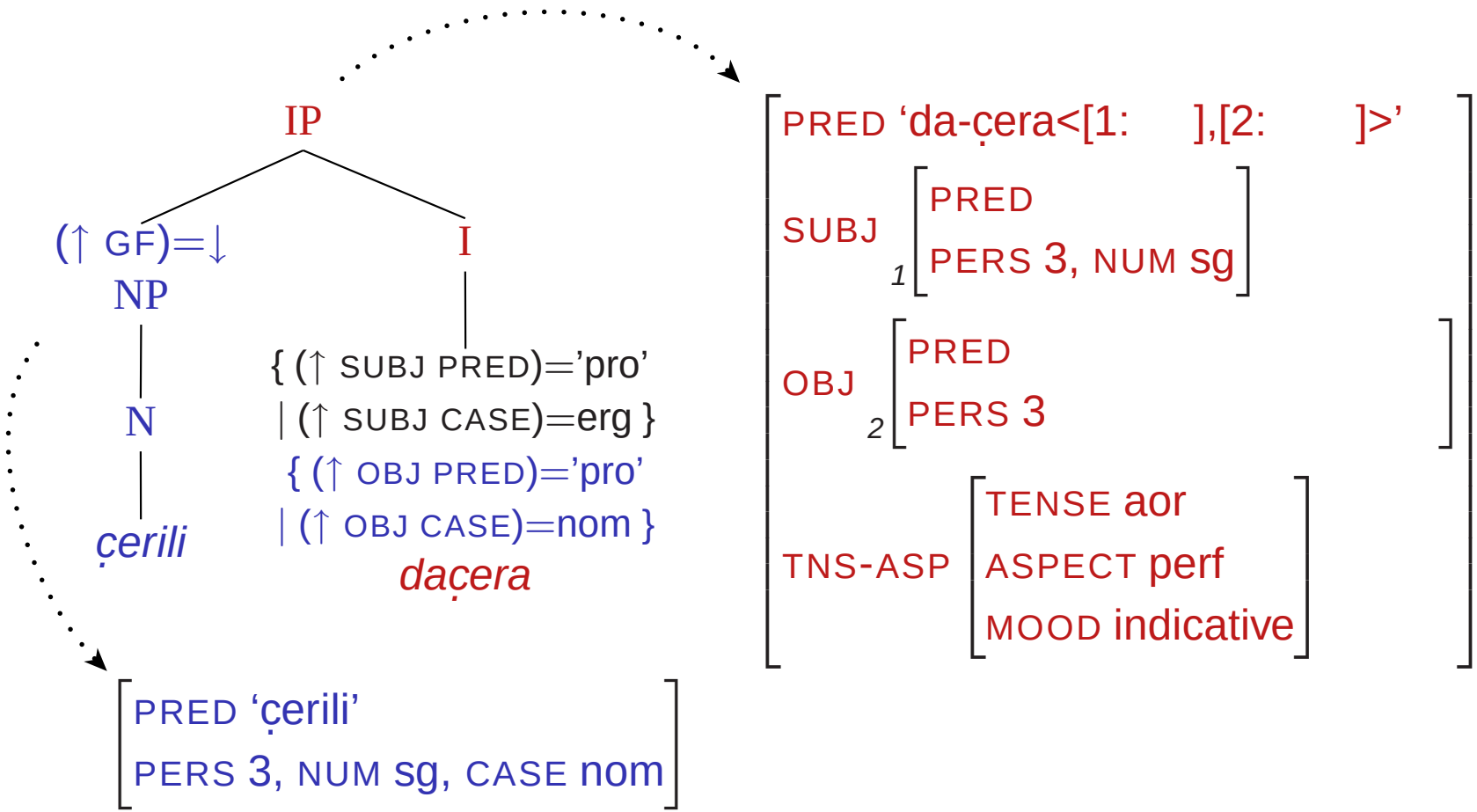

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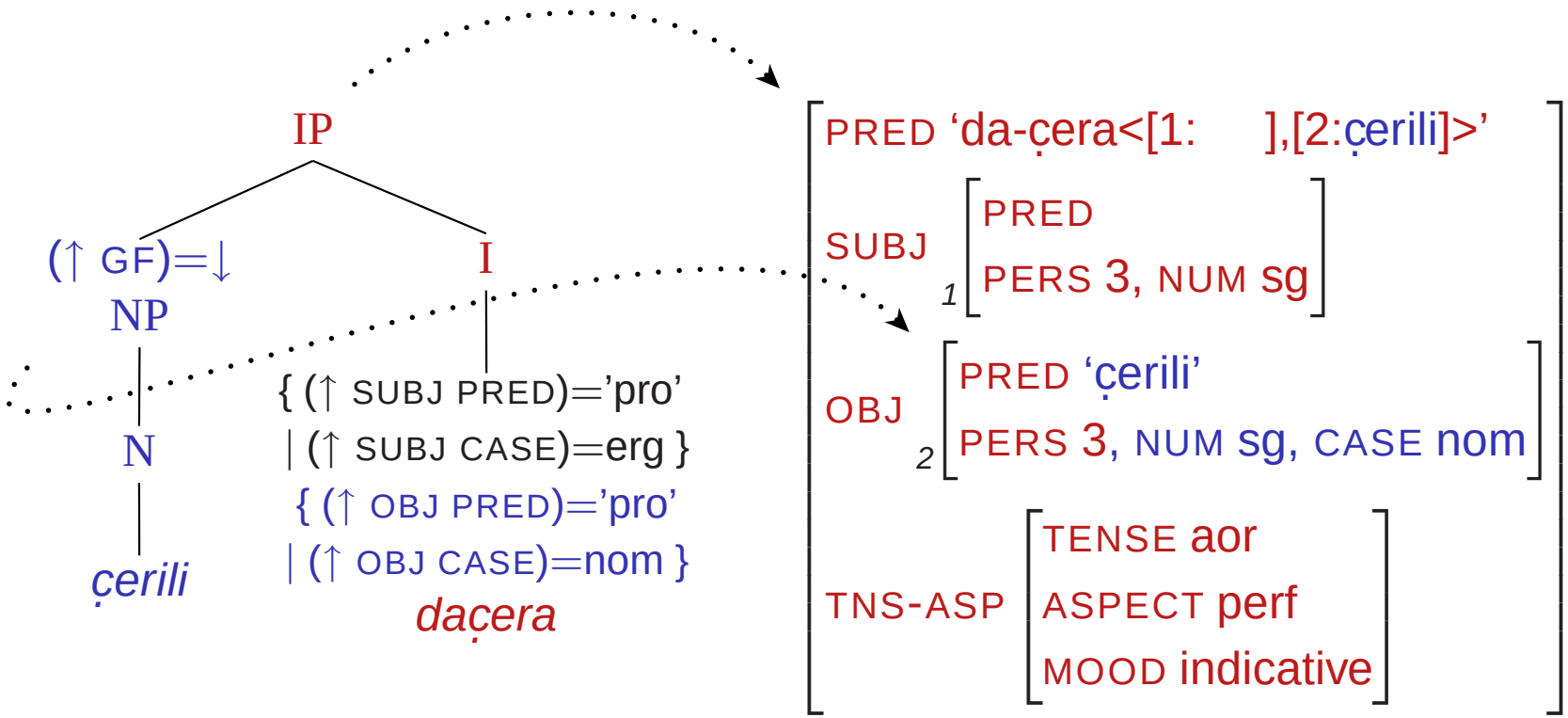

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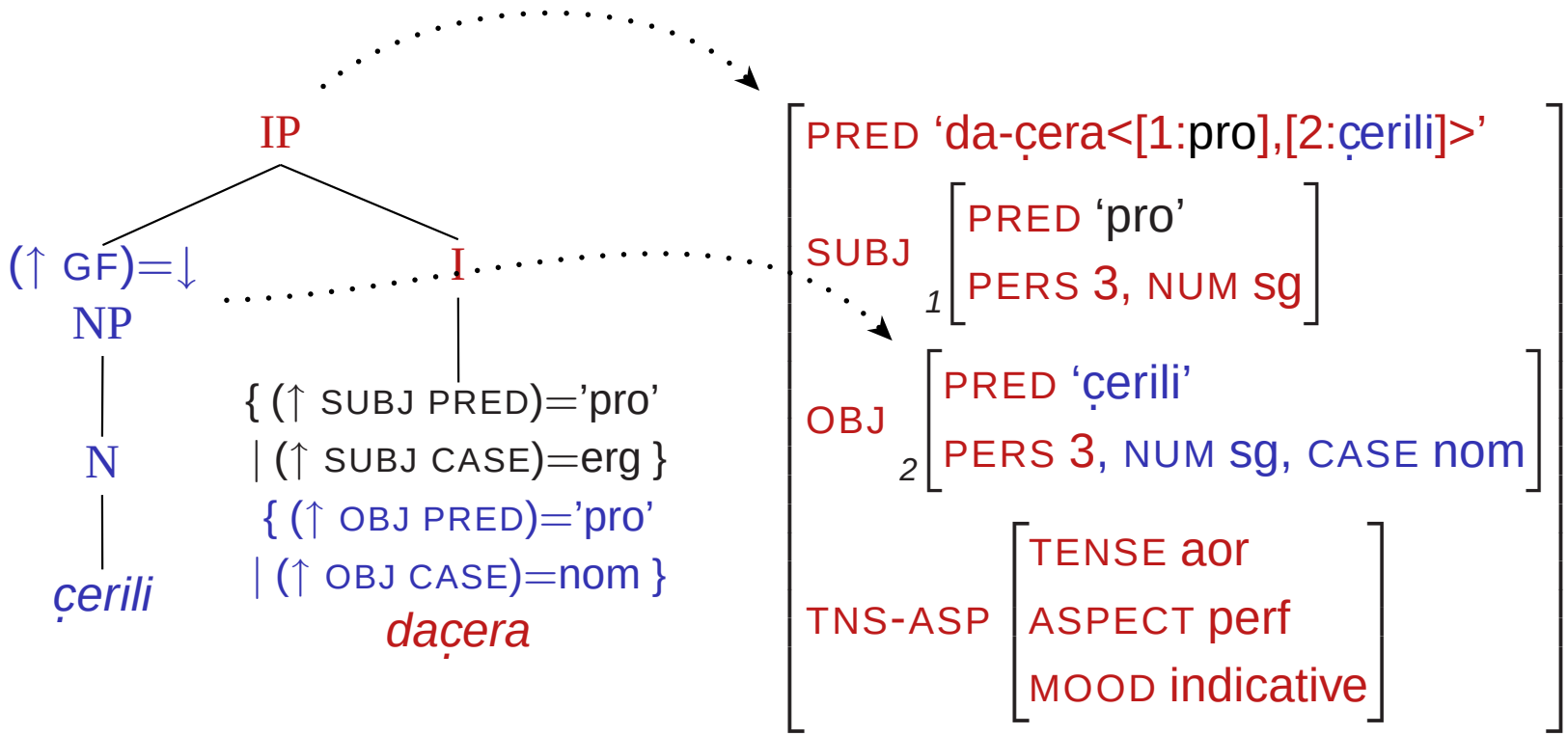
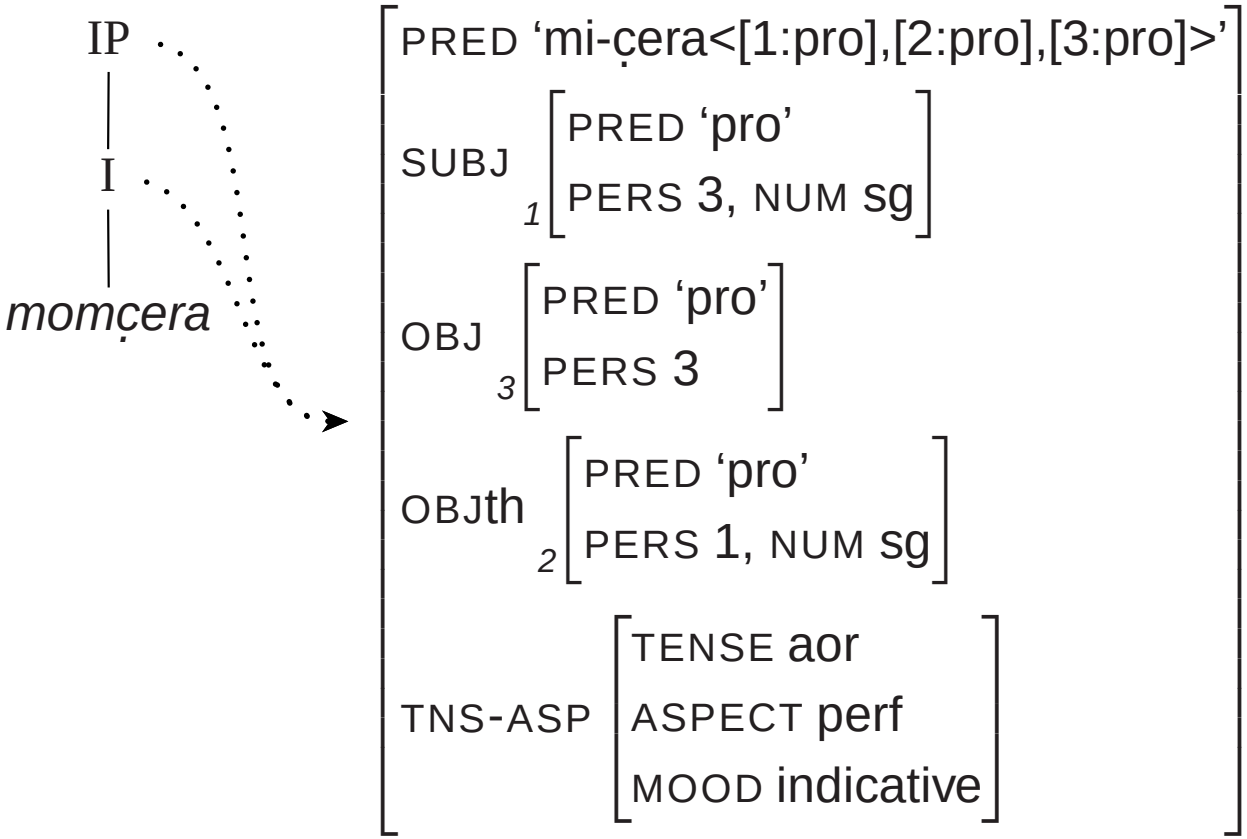


Pro-drop: Example

‘She wrote it to me.’



Predicate coordination

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In Georgian: less restrictive conditions:

1. The case of an argument needs only to be licensed by the verb nearest to it.

Predicate coordination: Examples

mas	[uqvars	da	apasebs]	tavis	meuġle-s.
he.DAT	loves	and	esteems	his-own	wife.DAT

‘He loves and esteems his own wife.’

Predicate coordination: Examples

mas [uqvars da apasebs] tavis meuġle-s.
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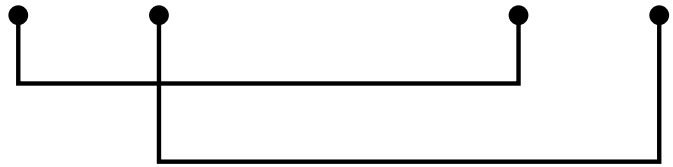
'He loves and esteems his own wife.'

	uqvars (IV) *'he loves her'*	apasebs (I) *'he esteems her'*
thematic roles	< exp, theme >	< exp, theme >
functions	SUBJ, OBJ	SUBJ, OBJ
case marking	DAT, NOM	NOM, DAT



Predicate coordination: Examples

*me [miqvars da mapasebs] čemi meuġle.
I I-love-her and she-esteems-me my wife.NOM

‘I [love, and am esteemed by,] my own wife.’

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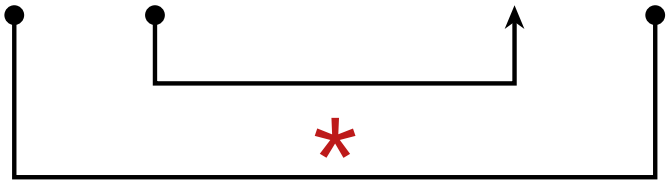

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‘His public activity is liked and esteemed by the people.’

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'His public activity is liked and esteemed by the people.'

	mosċons (IV) *'he likes it'*	pasdeba (II) *'it is esteemed'*
case marking	DAT, NOM	mier, NOM
functions	SUBJ, OBJ	OBL, SUBJ
thematic roles	< exp, theme >	< exp, theme >

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Simple case: both verbs license the same cases

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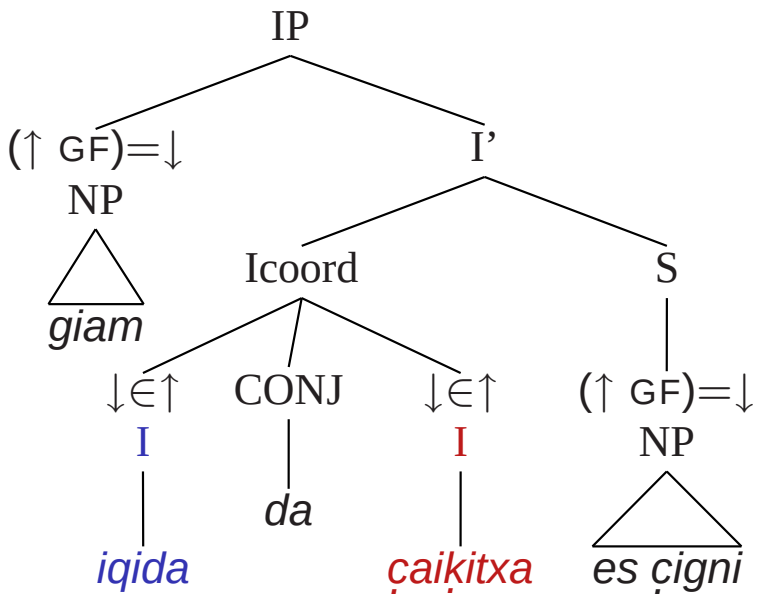

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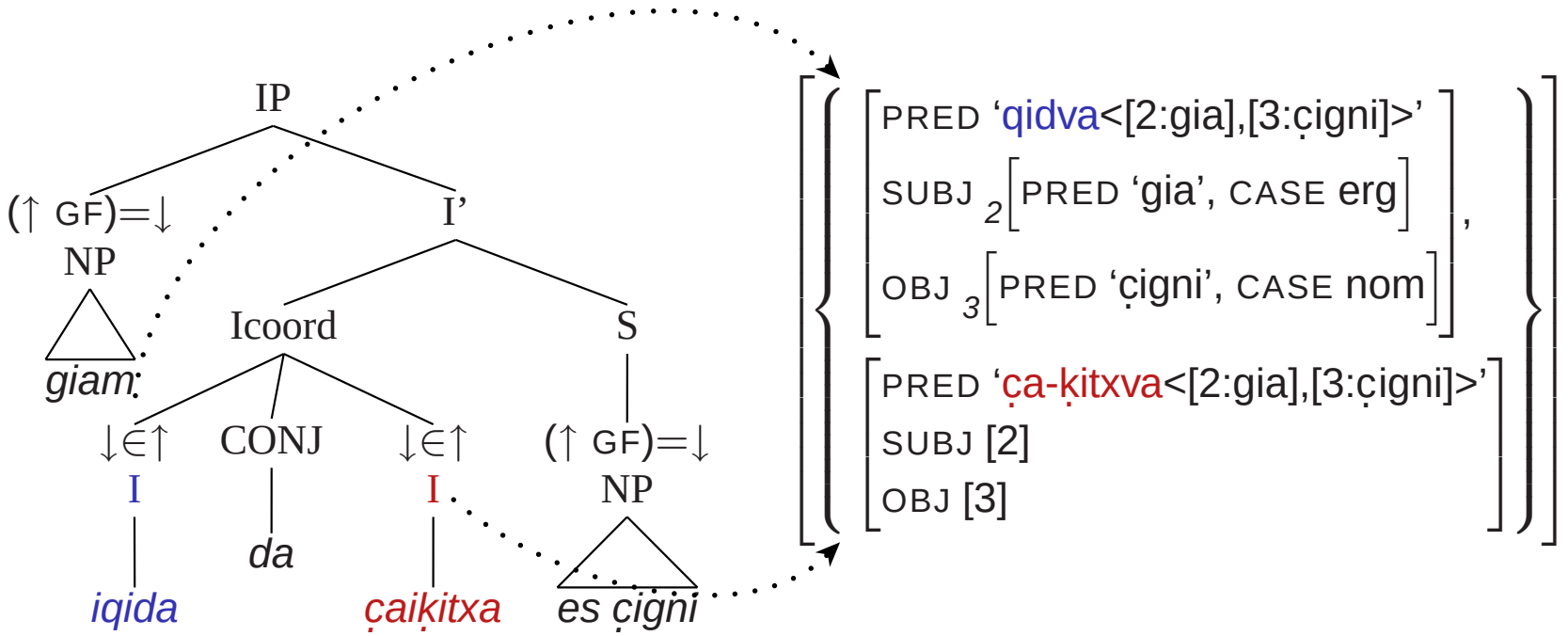
Simple case: both verbs license the same cases

giam iqida da ca-ḳitxa es c-igni.
Gia bought and read this book.



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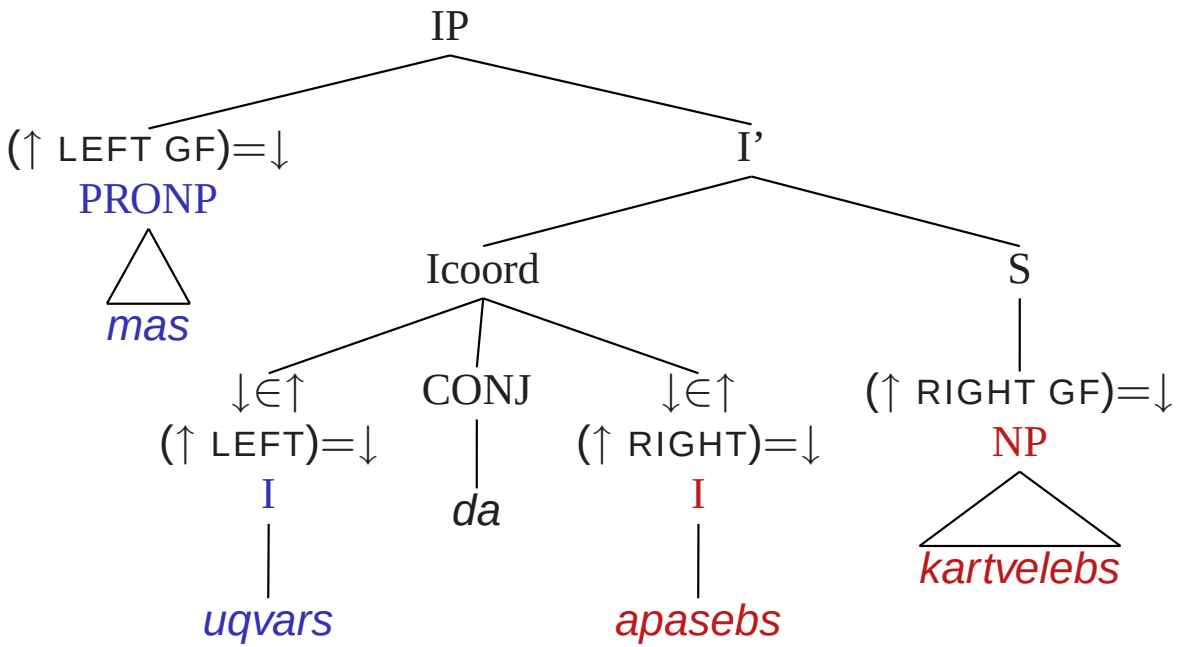

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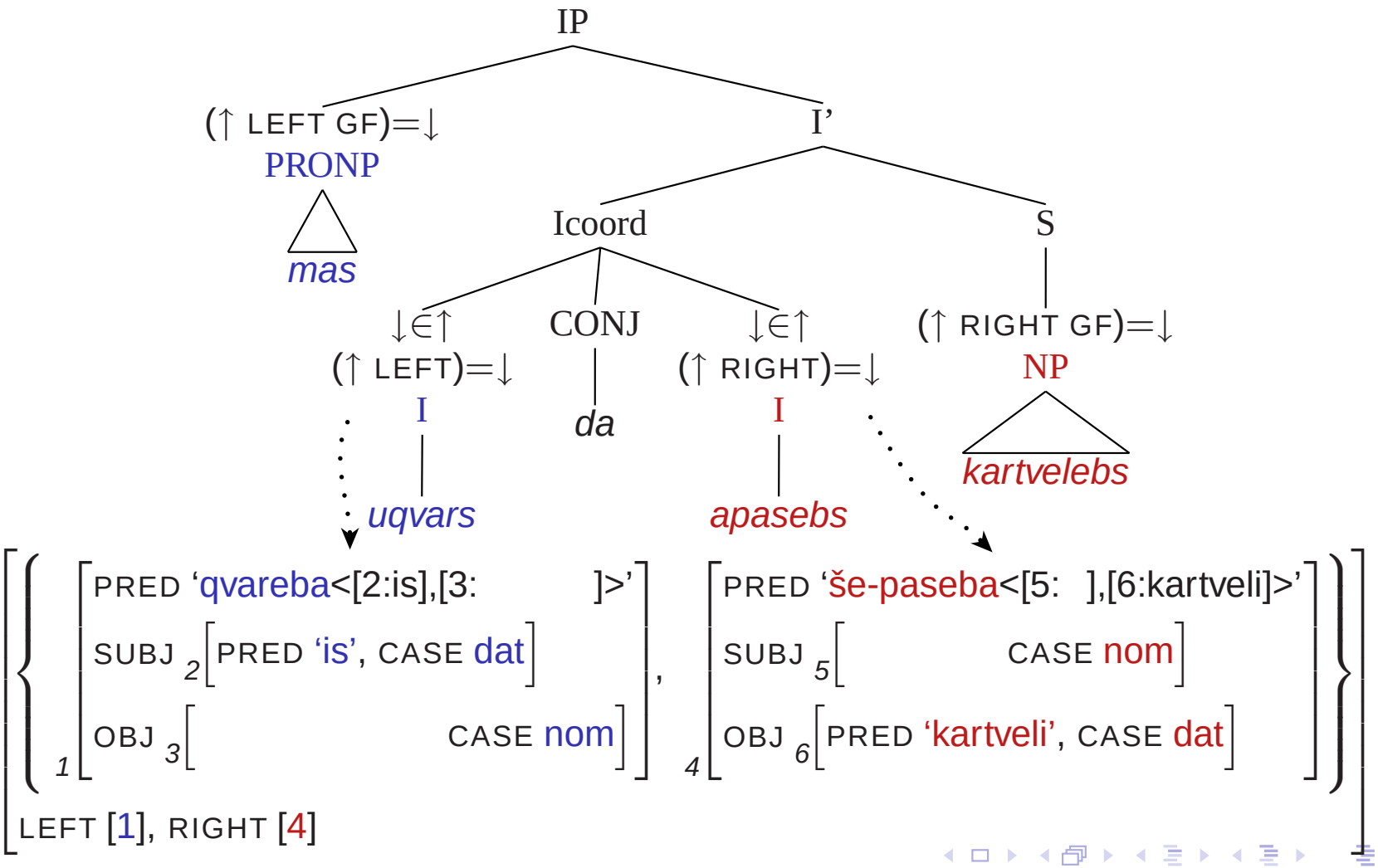

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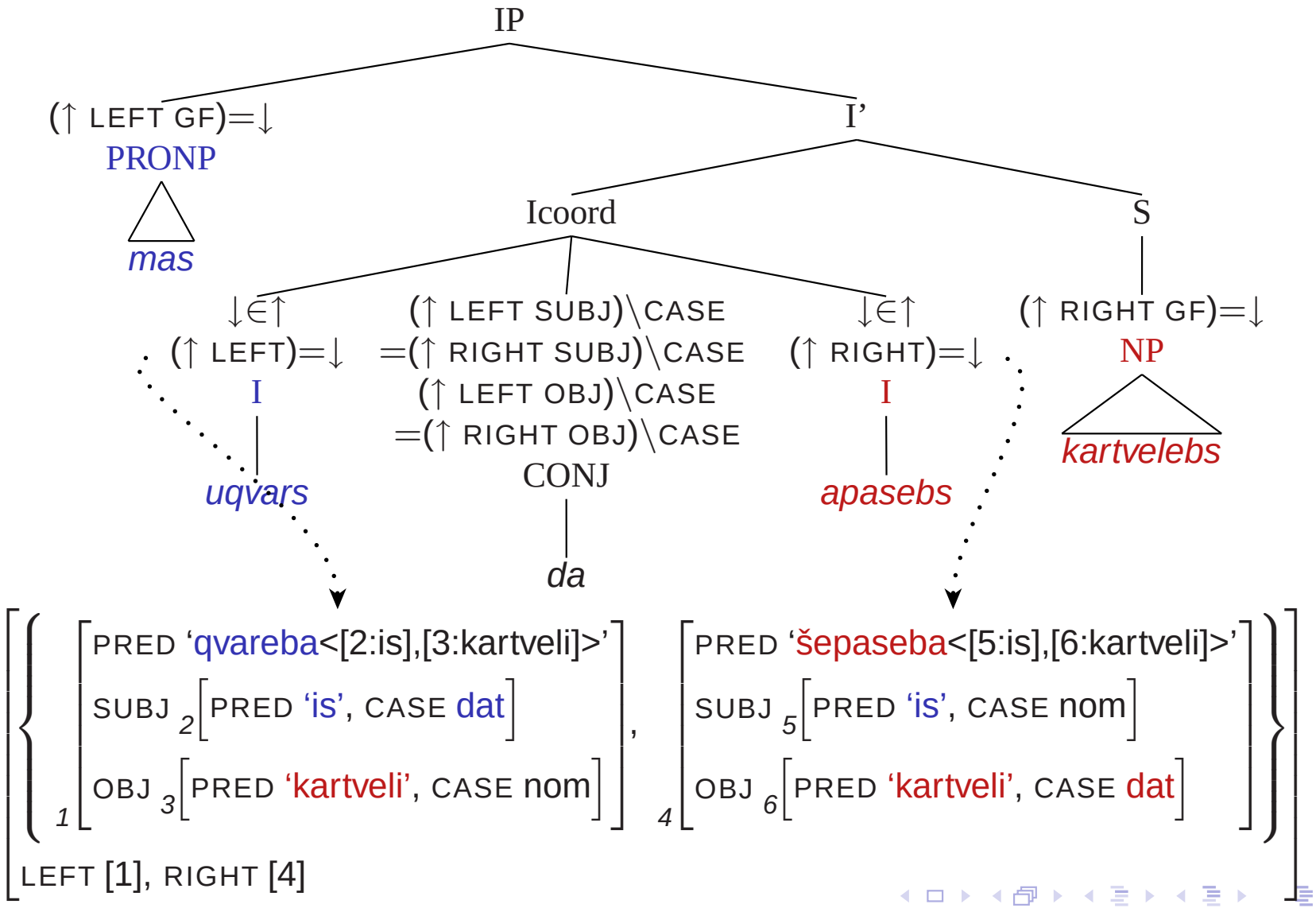

Discontinuous constituents

čem-i	gvar-i	ar	v-u-txar-i
[[my.NOM].POSS	last-name.NOM].NP	not	I.to-him.told.it.

‘I did not tell him my last name.’

gvar-i	ar	v-u-txar-i	čem-i
[last-name.NOM].NP	not	I.to-him.told.it	[my.NOM].POSS.

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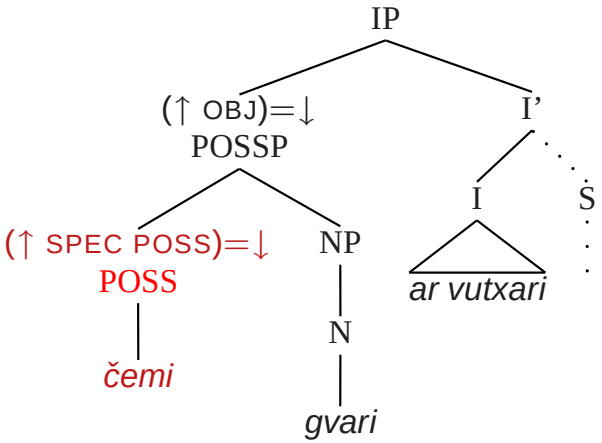

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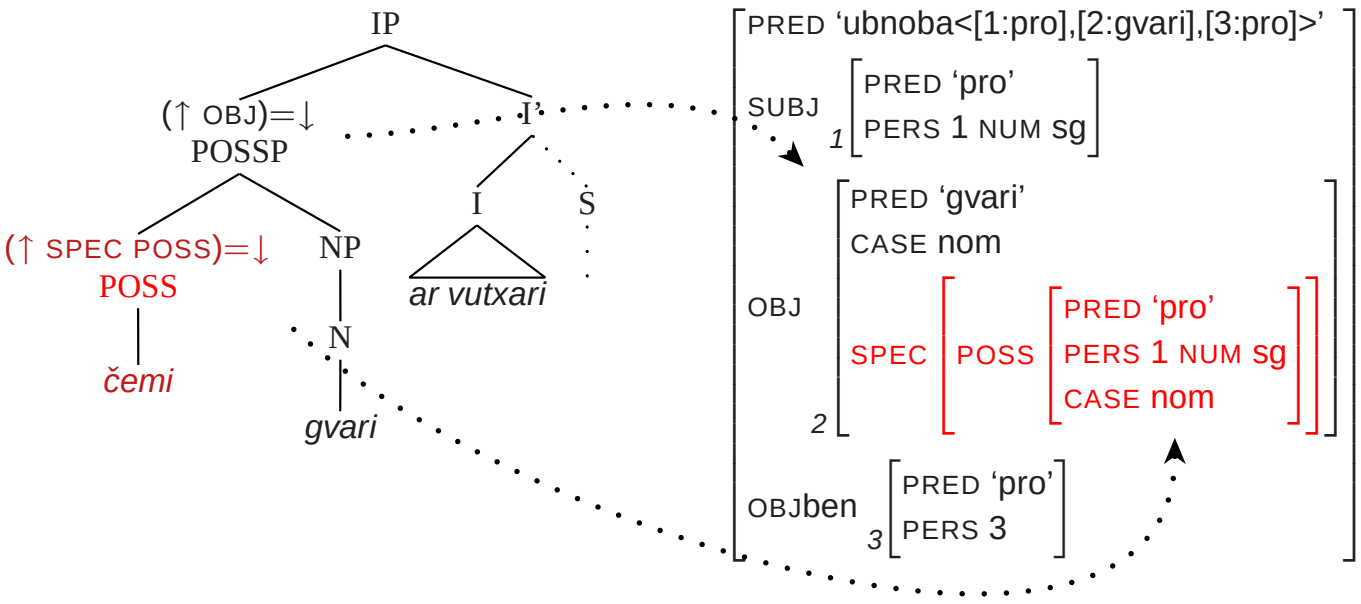

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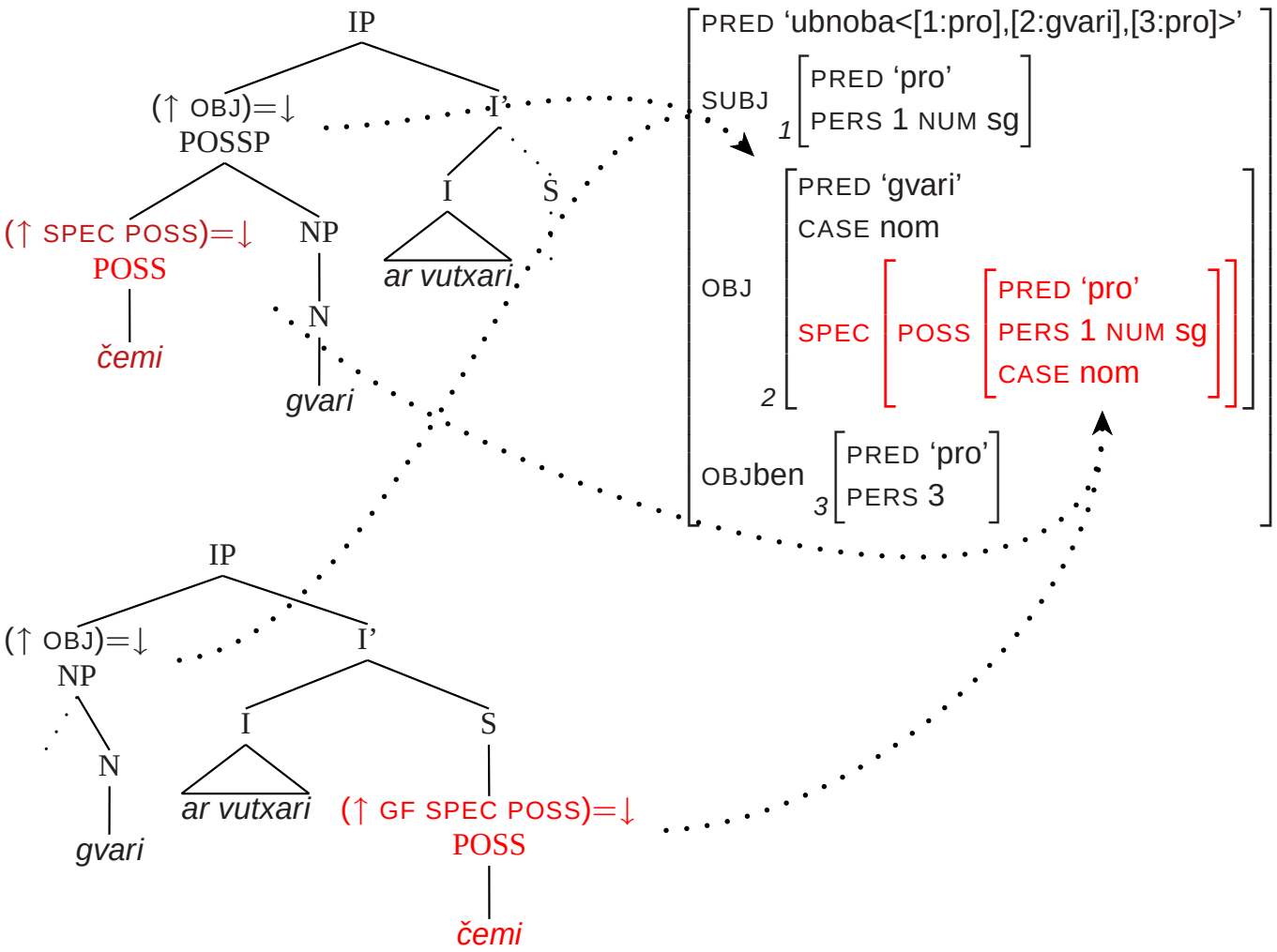

Outline

1 Introduction: The Georgian grammar project

2 Lexical-Functional Grammar

3 Morphology and Morphosyntax

4 Some aspects of Georgian syntax

5 Tools for LFG grammar development

XLE and *fst*

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- Tokenization and morphological analysis is normally done with the Xerox finite state tool, *fst*

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$\Rightarrow$ Need for manual disambiguation of the parses in an efficient way

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- F-structure discriminants are based on partial paths through f-structures

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I have harvested these text collections and imported them into corpus query software based on Corpus Workbench (IMS Stuttgart) which is being developed at Aksis.