Conjoined quadruplets in West Slavic

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DM meets Nano
July 16, 2025

Outline

Polish paradigms

In Polish, the case suffix u alternates with other suffixes throughout the singular paradigm of the main class of masculine nouns (Cameron-Faulkner & Carstairs-McCarthy 2000, Halle & Marantz 2008, Saloni et al. 2015):

	‘country’	‘leaf’	‘gentle-man’	‘brother’	‘money-grubber’	‘store’	‘column’
NOM	kraj	liɕtɕ	pan	brat	xtɕivʲɛts	sklɛp	swup
GEN	kraju	liɕtɕa	pana	brata	xtɕivtsa	sklɛpu	swupa
LOC	kraju	liɕtɕu	panu	bratɕɛ	xtɕivtsu	sklɛpʲɛ	swupʲɛ
DAT	krajɔvʲi	liɕtɕɔvʲi	panu	bratu	xtɕivtsɔvʲi	sklɛpɔvʲi	swupɔvʲi
INS	krajɛm	liɕtɕɛm	panɛm	bratɛm	xtɕivtsɛm	sklɛpɛm	swupɛm
VOC	kraju	liɕtɕu	panʲɛ	bratɕɛ	xtɕivtʂɛ	sklɛpʲɛ	swupʲɛ

ACC = NOM for inanimates, GEN for animates

Czech paradigms

In Czech, the situation is similar (Křen et al. 2022):

	‘age’	‘today’	‘team’	‘evening’	‘time’	‘forest’
NOM	vjɛk	dnɛʃɛk	tiːm	vɛtʃɛr	tʃas	lɛs
GEN	vjɛku	dnɛʃka	tiːmu	vɛtʃɛra	tʃasu	lɛsa
LOC	vjɛku	dnɛʃku	tiːmu	vɛtʃɛru	tʃasɛ	lɛsɛ
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ACC = NOM for inanimates; *-ovi* is the DAT and LOC of animates (not shown)

Conjoined quadruplets

Both languages have paradigms that are identical except for the genitive and locative (and, for Polish, the vocative), where all four possible combinations of suffixes are attested

	Polish				Czech			
	‘country’	‘leaf’	‘store’	‘column’	‘team’	‘evening’	‘time’	‘forest’
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- Czech also has an **ABA** pattern

Morphological theory and productivity

These patterns are thus a good proving ground for comparing Nanosyntax (more restrictive) and DM (less restrictive)

- All patterns must be somehow marked/encoded
- Both theories have “better” and “worse” ways of encoding patterns

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What would we expect from this representational difference? “Worse” patterns might be:

- non-existent (too strong!)
- relatively rare
- less productive (loanwords, wug tests, etc.)

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As evidence, we will look not at the *existence* of these paradigms but at less categorical properties: relative frequency, gradient generalizations, etc.

Outline

Distributed Morphology: basic rules

Cases decompose into *features* (cf. Jakobson 1984, Müller 2004), including [+oblique] – realized by default as u:

(1)

a. [+obl] ↔ u

b. GEN ↔ a — GEN = [+subj, +gov, +obl]

c. LOC ↔ ɛ — LOC = [−subj, −gov, +obl]

d. DAT ↔ ɔvʲi — DAT = [−subj, +gov, +obl]

e. INS ↔ ɛm — INS = [+subj, −gov, +obl]

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By the Subset Principle, (1-a) is less specific than the others and will always lose – this cannot be the whole system!

Option 1: *-u* unmarked

Features [Ga] and [Le] mark GEN a and LOC ɛ, respectively:

Czech	Polish	features	
tiːm	kraj	–	–
vɛtʃɛr	liɕtɕ	[Ga]	–
tʃas	sklɛp	–	[Le]
lɛs	swup	[Ga]	[Le]

These features are used to specify the context of rules; when absent, suffixes default to u:

(2) a. [+obl] ↔ u

b. GEN ↔ a / [Ga]___

c. LOC ↔ ɛ / [Le]___

Option 2: *-u* marked

Halle & Marantz (2008) choose the opposite approach: features [Gu] and [Lu] mark GEN u and LOC u, respectively:

Czech	Polish	features	
tiːm	kraj	[Gu]	[Lu]
vɛtʃɛr	liɕtɕ	–	[Lu]
tʃas	sklɛp	[Gu]	–
lɛs	swup	–	–

These features trigger impoverishment rules that delete more specific case features, allowing u to surface:

(1) a. [+obl] ↔ u
b. GEN ↔ a
c. LOC ↔ ɛ

(3) a. [+subj, +gov] → Ø / [Gu]___
b. [−subj, −gov] → Ø / [Lu]___

This is more complicated, but they have reasons for it (which won't be relevant here).

Option 3: all marked

A third possibility: all case forms are marked:

Czech	Polish	features	
tiːm	kraj	[Gu]	[Lu]
vɛtʃɛr	liɕtɕ	[Ga]	[Lu]
tʃas	sklɛp	[Gu]	[Le]
lɛs	swup	[Ga]	[Le]

These are compatible with either set of rules and may or may not yield different results from them, depending on your view of productivity.

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lɛs	swup	[Ga]	[Le]

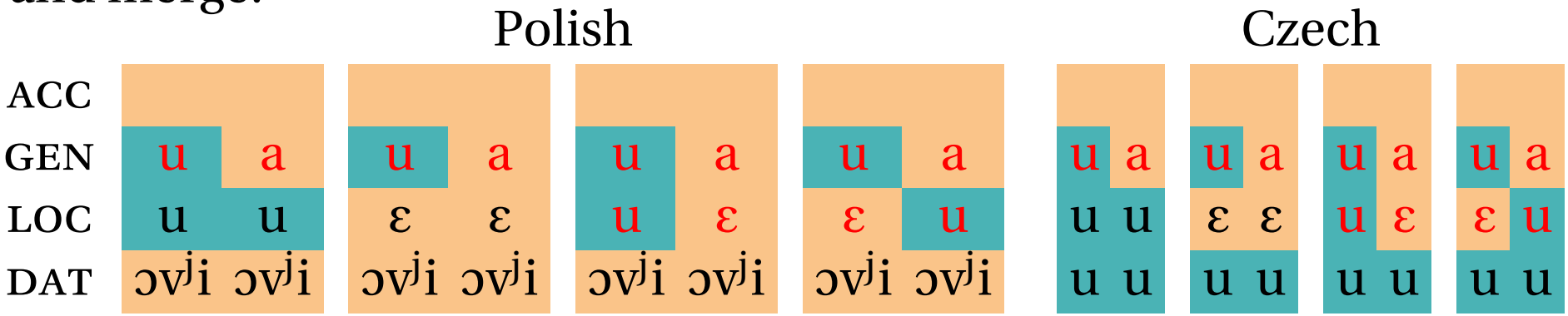
These are compatible with either set of rules and may or may not yield different results from them, depending on your view of productivity.

DM allows us to posit and compare multiple analyses, but does not substantively limit the analytical options.

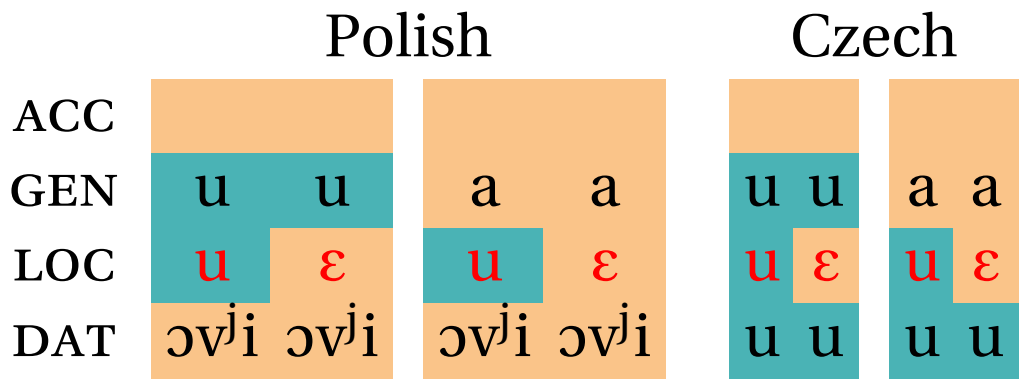
Nanosyntax: basic structure

Functional sequence for case: ACC–GEN–LOC–DAT (Caha 2009, Janků 2022).

Janků (2022): Two paradigms with identical features can start out the same and then diverge (no examples in our data) or start out different and merge:

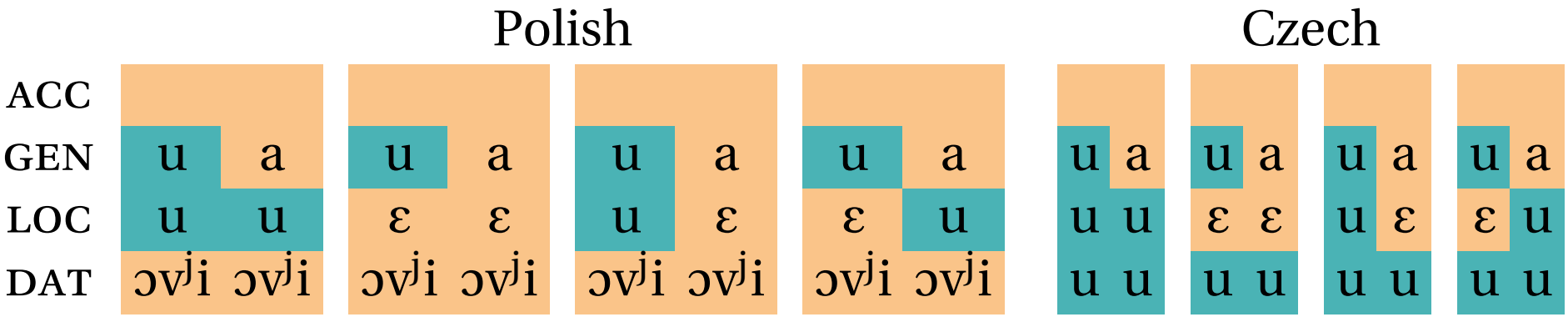


…but once they have diverged, they cannot merge again:



Productive pairs

Thus, *at most two* of the patterns in each language can be captured through differences in root size and shape:



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	Polish								Czech							
ACC																
GEN	u	a	u	a	u	a	u	a	u	a	u	a	u	a	u	a
LOC	u	u	ɛ	ɛ	u	ɛ	ɛ	u	u	u	ɛ	ɛ	u	ɛ	ɛ	u
DAT	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	u	u	u	u	u	u	u	u

- Since Czech has u in the dative, one pattern is ABA and can't be captured.

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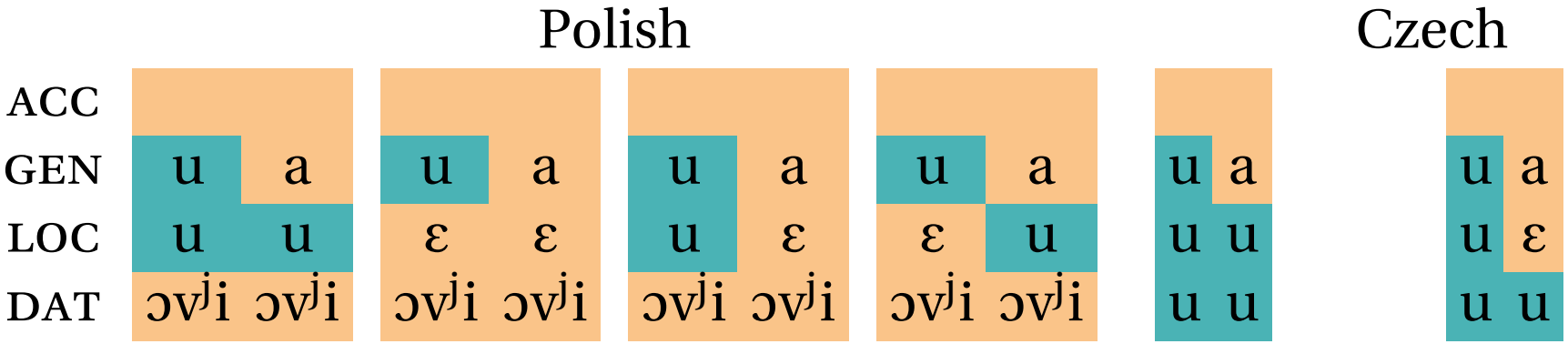

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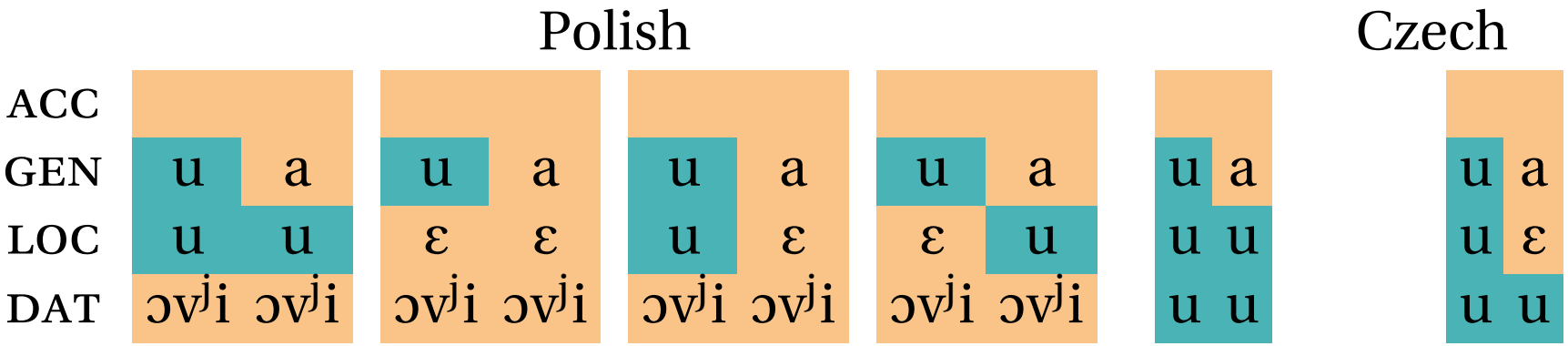

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- I don't think the "cross pattern" can be captured either.

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	Polish						Czech			
ACC										
GEN	u	a	u	a	u	a	u	a	u	a
LOC	u	u	ɛ	ɛ	u	ɛ	u	u	u	ɛ
DAT	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	ɔvʲi	u	u	u	u

- Since Czech has u in the dative, one pattern is ABA and can't be captured.
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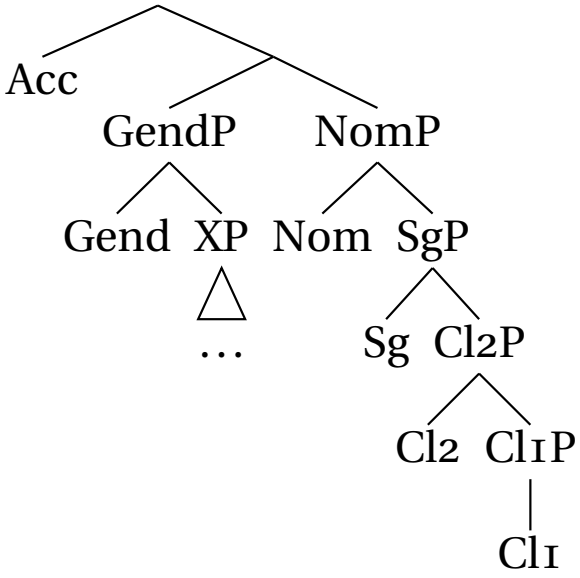
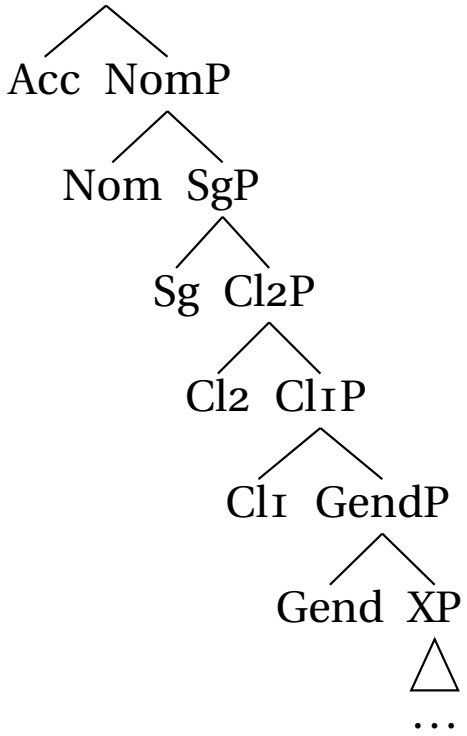
Example: Janků (2022)

Janků (2022): uu ([tiːm]) and au ([vɛtʃɛr]) differ in their shape, but not their size (cf. Blix 2021):

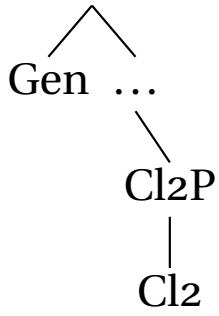
(4) AccP ↔ /tiːm/



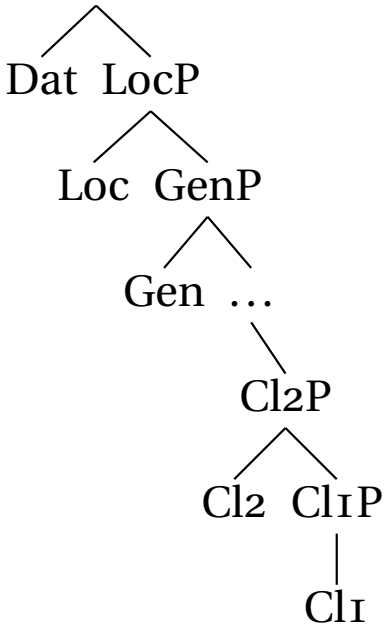
(5) AccP ↔ /vɛtʃɛr/



(6) GenP ↔ /a/



(7) DatP ↔ /u/

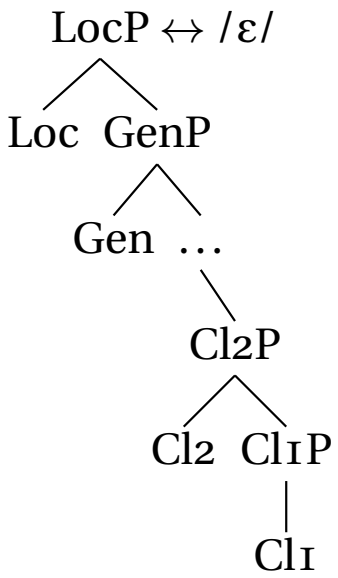


- [vɛtʃɛr] (au): backtracking to Cl2 for GEN and Cl1 for LOC
- [tiːm] (uu): left branch gets passed up to top at GEN

Private lexical entries

Other case forms (in this example, LOC ɛ) are referenced in *private lexical entries* (De Clercq & Vanden Wyngaerd 2019):

(8)



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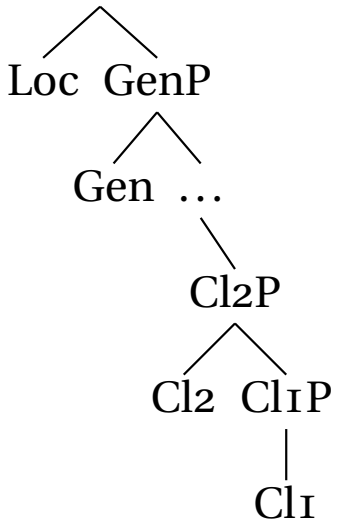
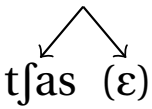


(9) LocP ↔ /ʧas/



These can only be accessed through lexical entries with *pointers* to both stem and case form like (9)

- These entries (and the patterns that require them) are thus *unproductive*

Comparison

DM analyses:

better	worse	
GEN u, LOC u	GEN a, LOC ɛ	(these can be mixed and matched)
GEN a, LOC ɛ	GEN u, LOC u	
	GEN u, a; LOC u, ɛ	

Nanosyntax analyses:

better	worse	
uu, au	uɛ, aɛ	(Polish only)
uu, aɛ	uɛ, au	
uɛ, aɛ	uu, au	

- In DM, the cases are independent – in Nanosyntax, they are not
- In DM, DAT u has no effect – in Nanosyntax, it limits options in Czech

Outline

Polish distribution

Polish inanimate lemma counts from Saloni et al. (2015) (animate nouns have GEN a):

		LOC			
		u	u∼ɛ	ɛ	% u
GEN	u	2570	0	8095	24.1%
	u∼a	363	4	352	50.5%
	a	4429	0	1044	80.9%
	% u	34.9%	0.0%	85.3%	

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- Most common to have u in *exactly one* case
- Dąbrowska (2001): in acquisition, children treat neither u nor a as the productive default GEN
- LOC is (almost fully) *phonologically conditioned*:
  - ɛ: non-affricate dentals, non-palatalized labials ([sklɛp], [swup])
  - u: all others ([kraj], [liɕtɕ])

DM analysis: basics

The relatively even distribution and acquisition pattern of GEN suggests that neither is more productive than the other

- Both suffixes should be marked with a feature: [Gu] and [Ga]
- Every masculine (inanimate) noun *must have* one of these two features

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The phonological conditioning of LOC can be encoded directly into rules of realization (without features) or learned as correlations between phonological form and features (cf. Gouskova, Newlin-Łukowicz & Kasyanenko 2015)

- Nouns marked with [Le] only end in non-affricate dentals or non-palatalized labials
- Learning of this correlation is *enabled* by the DM architecture but does not *follow from* it

DM analysis: interaction

The gradient correlation that nouns tend to have u in either GEN or LOC but not both can likewise be learned as a correlation between features (cf. Halle & Marantz 2008)

- [Gu] and [Lu] tend not to cooccur on lexical items
- Neither do [Ga] and [Le]

… or between [Gu]/[Ga] and the same phonological features predicting LOC (more fine-grained)

- t#: 96% u (2007/2089)
- j#: 81% u (101/125)
- l#: 63% u (407/647)
- r#: 54% u (756/1407)

Nanosyntax analysis

If (as in Nanosyntax) we can encode at most two out of the four patterns, how many of the non-variable nouns can we get?

	pair	productive
✗	uɛ, au	77.6%
✗	uu, uɛ	66.1%
✓	uɛ, aɛ	56.6%
✓	uu, au	43.4%
✗	au, aɛ	33.9%
✓	uu, aɛ	22.4%

- The main generalization – that most nouns have u in exactly one case – cannot be captured in Nanosyntax (the excluded "cross pattern")
- The best we can do is, using an analysis very similar to that of Janků (2022) for Czech: GEN u or a, LOC fixed ɛ

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Nanosyntax implications

Symmetrical lexical variation in GEN

- Fits with the acquisition data that neither suffix is more productive than the other

Asymmetrical lexical variation in LOC

- All forms with LOC u have identical lexical entries to the others, but are referenced in pointers alongside a private LOC lexical entry
- Assuming speakers can learn generalizations over the shapes of lexical entries:
  - They can learn the gradient phonological patterns describing GEN
  - However, they *cannot* learn the categorical phonological conditioning of LOC
  - Unless this phonological distinction is actually *allophony*, i.e. LOC u and ɛ share an underlying form

Polish comparison

- The best analysis within DM explains the lexical and acquisition data in GEN and allows for speakers to learn phonological generalizations over case allomorphy
- The best analysis within Nanosyntax explains the lexical and acquisition data in GEN but can't adequately capture or allow for the LOC patterns (without some further clever work)

Czech distribution

Czech inanimate lemma counts from Křen et al. (2022) (animate nouns have GEN a and LOC ovi):

GEN \ LOC	u	u∼ɛ	ɛ	% u
u	9686	523	21	94.7%
u∼a	145	18	3	87.3%
a	32	19	31	39.0%
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Czech inanimate lemma counts from Křen et al. (2022) (animate nouns have GEN a and LOC ovi):

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- The vast majority of nouns have u in both cases
- Nouns that have GEN a also tend to have LOC ɛ, and vice versa
  - Czech speakers have learned this correlation, and apply it in wug tests (Tabachnick 2023, 2024)

DM analysis

In both cases, u is the clear default

- Nouns with u are unmarked
- GEN a and LOC ɛ are marked with [Ga] and [Le], respectively
- Underlying forms: /tiːm/, /vɛtʃɛr$_{[Ga]}$/, /tʃas$_{[Le]}$/, /lɛs$_{[Ga,\ Le]}$/

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The correlation between GEN a and LOC ɛ is learned as a correlation between features (Tabachnick 2023)

- Nouns that have [Ga] also tend to have [Le]

Nanosyntax analysis

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  - Posits a complex left branch for the overwhelmingly most common paradigm
- GEN a, LOC ɛ
  - Captures the correlation between the two (though too strongly)
  - Private lexical entries for other patterns (uɛ, au) duplicate productive case endings

Czech comparison

- The use of features in DM allows for speakers to learn generalizations through pattern matching
- The Nanosyntax options have trouble with the interplay between the two cases

Outline

General summary

Features of DM:

- Flexible enough to handle all of the data with various levels of productivity
- Competing analyses within DM may fare better or worse, but these are not triumphs for DM proper
- Correlations between paradigm cells can be learned in a separate pattern matching module outside the DM architecture

Features of Nanosyntax:

- Only a couple of options, inevitably leaving some patterns unproductive
- Some of the more intricate gradient patterns are probably in the wrong place for the pattern matching module to pick them up
- Correlations between paradigm cells are often enforced either too strictly or not strictly enough

Architectural question 1

Which patterns can be extended to new lexical items?

- DM: Unmarked patterns only, or any (depends on your theory of productivity)
- Nano: Patterns not requiring private lexical entries

Architectural question 2

How does the pattern matching module capture gradient (or even categorical) generalizations over or between patterns?

- DM: Generalizations over underlying forms of words that share a feature
- Nano:
  - Generalizations over underlying forms of words whose lexical entries have the same shape
  - But this is not enough: we'd also need generalizations over underlying forms of words whose lexical entries are referenced in pointers pointing to analogous private lexical entries

Architectural question 3

Are more frequent patterns structurally simpler?

- DM: Most frequent patterns are more default, so typically marked with fewer features
- Nano: Uncommon patterns may force common ones into structural features like complex left branches

Final thoughts

- Practitioners in both DM and Nano typically ignore quantitative data like gradient generalizations and relative frequency of patterns
- These are part of speakers' knowledge of language and must be accounted for
- In my work, I've found that DM can be extended and paired with an (independently necessary) pattern matching module to conveniently handle the relevant patterns – in Nano, this will be more of an uphill climb
- Morphologists working in every theory should take this type of data seriously!

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