

Suffix independence in  
Paraguayan Guarani nasal harmony  
stress, nasality, and nasalization

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# Introduction

- Crosslinguistically, prefixes and suffixes may show asymmetries in their participation in phonological rules.
- Example: Yaka (Bantu, Zaire) prefix independence (Hyman 1995; Elkins 2020)

(1) a. tsúb-iḽḽi                      b. tsúm-iḽḽi                      c. ma-ḽáfú, \*ma-ḽáfú  
       `to wander'                      `to sew'                      `palm wine'

- **Today:** investigate the phonological behavior of suffixes in Paraguayan Guarani.
  - Tupi-Guarani language spoken in Paraguay by 5-6 million people.
  - **Focus:** nasality and nasalization.
  - Language has oral/nasal contrast and both leftward and rightward nasalization.

# Introduction

- ★ I argue that Paraguayan Guarani shows **suffix independence**.

(2) a. [j]a-jero'ki                      b.  $\overleftarrow{\text{ñã-kõsĩ'nã}}$                       c. o-[j]ehu- $\overleftarrow{\text{rõ}}$ , \* $\overleftarrow{\text{õ-ñẽhũ-rõ}}$   
       `we dance'                              `we cook'                              `if it happens'

- ★ Suffix independence reveals:

1. Oral/nasal contrast and nasalization are **right-aligned**, rather than specified at **stressed syllables**.
2. Cyclic morphological structure for suffixes.

- ★ Stressed syllable positional faithfulness (Beckman 1997; 1998), the prominent analysis for decades, is no longer supported.

# Roadmap

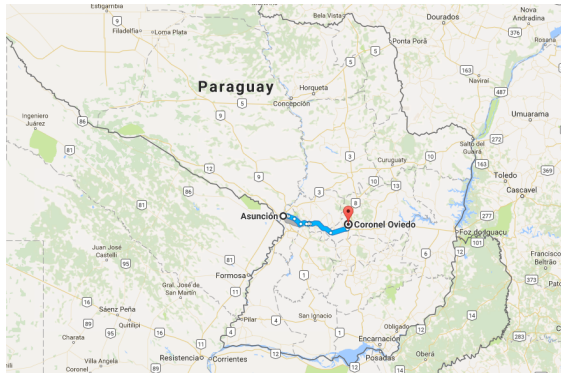
1. Language background and basic phonology
2.  $\sigma$ -positional faithfulness in roots and prefixes (Beckman 1998)
3. Nasality and nasalization in suffixes
4. Analysis
  - Right-edge faithfulness + OO-correspondence
  - Reevaluating  $\sigma$  positional faithfulness
5. Progressive harmony
6. Discussion
  - Typology of prefix-suffix asymmetries
  - A possible prosodic analysis
  - Dialectal variation in progressive harmony

# Background

- Paraguayan Guarani (Tupi-Guarani, Tupian) is spoken by 5-6 million in Paraguay and neighboring areas of Argentina and Brazil.
- Guarani and Spanish are the official languages of Paraguay (Guarani since 1992).
- Learned as a first language for many children. Around 80% of the population speak Guarani at home.
- Guarani has been described for decades (Gregores & Suárez 1957, Estigarribia 2020) and has significantly contributed to phonological theory (Beckman 1998; Piggott 2003)

# Background

- All data collected in consultation with **8** native speakers.
- **6**: in-situ fieldwork in Coronel Oviedo, Paraguay.
- **2**: virtual fieldwork; Asunción and Concepción.



# Basic phonology

Guarani phonemic inventory:

(3)

p	t			k	ʔ '
m <sup>b</sup>	n <sup>d</sup>			ŋ <sup>g</sup>	
m	n		ɲ ñ	ŋ ã	
			ɕ j		
	s	ʃ ch			
v v	r r			ɥ g	

(4)

i, ï	i, ï (y, ÿ)	u, ù
e, ë		o, ò
	a, ã	

- Guarani has nasal-oral stops instead of voiced stops.
- These contrast with voiceless stops.
- 6 phonemic vowel qualities, all oral and nasal counterparts.

# Basic phonology

- All Guarani syllables are type CV.
- Nasal-oral stops are legal onsets and occur word-initially.

(5) a. mbokaja                      b. ndu                      c. ngotyó  
      `coconut'                      `noise'                      `towards'

- Predominantly stress final, few words with (ante-)penultimate stress.
- Stress shifts to the rightmost lexically stressed morpheme.  
→ Suffixes are unpredictably “stressable” or “unstressable”

(6) a. a-ka'ru-ta                      b. a-karu-'se                      c. a-karu-'se-ta  
      1SG-eat-FUT                      1SG-eat-DES                      1SG-eat-DES-FUT  
      `I will eat'                      `I will want to eat'                      `I will want to eat'

- Prefixes are never stressed.



# Roadmap

1. Language background and basic phonology
2. **σ-positional faithfulness in roots and prefixes** (Beckman 1998)
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## σ-positional faithfulness in nasality

- In roots and prefixes, the nasal/oral contrast and regressive nasalization are closely tied to **stress**.
- Vowel nasality only contrastive at stressed syllables, and these trigger leftward (regressive) nasalization.
    - "positional neutralization, triggering" (Beckman 1998)
- (7) a. tu'pa                      b.  $\overleftarrow{\text{tũ'pã}}$                       c. \*tu'pã                      d. \*tũ'pa
- 'bed'                                      'god'
- voiceless segments are *transparent*

## σ-positional faithfulness in nasality

### 2. Leftward nasalization is blocked by other stressed syllables.

- “*positional blocking*” (Beckman 1998)

(8) a.  $\overleftarrow{\text{avati-mi}^{\sim}\underline{\text{ri}}}$   
corn-small  
'wheat'

b.  $\overleftarrow{\text{ava-n}^{\sim}\underline{\text{e}}^{\sim}\underline{\text{?e}}}$   
man-word  
'Guarani' (lang.)

c.  $\overleftarrow{\text{pi}^{\sim}\underline{\text{a-p}}^{\sim}\underline{\text{ra}}}$   
heart-pretty  
'kindness'

## σ-positional faithfulness in nasality

Beckman's (1998) proposal for Guarani nasality and nasalization:


- IDENT-σ(NASAL): protect input nasality/orality at stressed syllables.
- \* $\tilde{V}$  » IDENT(NASAL): neutralizes any input oral/nasal contrast in vowels.
- IDENT-σ(NASAL) » \* $\tilde{V}$  » IDENT(NASAL): neutralizes only in **unstressed** vowels.

	/t̥ <u>pa</u> /	IDENT-σ(NASAL)	* $\tilde{V}$	IDENT(NASAL)
(9)	a. t̥ <u>pa</u>		*!	
	b. t <u>pa</u>			*
	c. $\overleftarrow{t̥p̃a}$	*!	**	*

## σ-positional faithfulness in nasality

- But, unstressed vowels nasalize in the presence of a stressed nasal vowel:  $\overleftarrow{\text{tupā}}$  'god'
- ALIGN-L(NASAL): align nasality to the left edge of the word.
- ALIGN-L(NASAL)  $\gg$  \* $\tilde{V}$   $\gg$  IDENT(NASAL): leftward nasalization.


(10)

/ <u>tupā</u> / 'god'	ID-σ(NAS)	ALN-L(NAS)	* $\tilde{V}$	ID(NAS)
a. <u>tupā</u>		*!	*	
b. tu <u>p</u> a	*!			*
 c. $\overleftarrow{\text{tupā}}$			**	*

## σ-positional faithfulness in nasality

- This ranking also predicts "positional blocking" in compounds.
- IDENT-σ(NASAL) ≫ ALIGN-L(NASAL): lexically stressed syllables keep their input nasality/orality over demands for leftward nasalization.

(11)

/pi'a-porã/ 'kindness'	ID-σ(NAS)	ALN-L(NAS)	*Ṽ	ID(NAS)
a. pi'a-porã		***!*	*	
b. $\overleftarrow{\text{pi}}'\overleftarrow{\text{a}}\text{-p}\overleftarrow{\text{or}}\overleftarrow{\text{ã}}$	*!		****	****
 c. pi'a- $\overleftarrow{\text{p}\overleftarrow{\text{or}}\overleftarrow{\text{ã}}}$		**	**	**
d. $\overleftarrow{\text{pi}}'\overleftarrow{\text{a}}\text{-}\overleftarrow{\text{p}\overleftarrow{\text{or}}\overleftarrow{\text{ã}}}$		**	***!	***

- Non-local spread also ruled out (Candidate d)

# The status of nasal-oral stops

- Recall that Guarani has nasal-oral stops (**mbokaja** ‘coconut’)
- Previous literature describes Guarani nasal-oral stops as “prenasalized stops”, [m<sup>b</sup>].
- Implies that they’re underlyingly *plain voiced stops*, argued by Piggott (2003) for Guarani.
- ★ I instead argue that they’re underlying **full nasal consonants** ([m<sup>b</sup>]) that **post-oralize** in certain environments.
  1. In full complementary distribution with nasal consonants.
  2. Trigger regressive nasalization in any position (regardless of stress)

# The status of nasal-oral stops

## 1. Nasal-oral stops and nasal consonants are in complementary distribution.

- nasal-oral stops before **oral** vowels
- full nasal consonants before **nasal** vowels
- Same pattern for  $j \sim \tilde{n}$ .

(12) a.  $\underline{mb}o'ʔa$       b.  $\overleftarrow{m\tilde{o}}'ʔ\tilde{a}$       (13) a.  $a'jja$       b.  $\overleftarrow{\tilde{a}'\tilde{n}\tilde{a}}$   
       `position'      `almost'      `during'      `evil', `bad'

- alternations reflected in the orthography of the language.



# The status of nasal-oral stops

2. Nasal-oral stops trigger regressive nasalization in stressed and unstressed positions.

(14) a.  $\overleftarrow{\text{pānā}}\text{m}^{\text{b}}\text{i}$   
'butterfly'

b.  $\overleftarrow{\text{ãŋ}}^{\text{g}}\text{i}'\text{ru}$   
'friend'

→ As with  $\tilde{V}$ , they trigger regressive nasalization at a long distance.

(15) a.  $\overleftarrow{\text{n}^{\text{d}}\text{a-}\text{j}\text{a-}\text{j}\text{o-ha}^{\text{i}}\text{'hu}^{\text{i}}}$   
NEG-1PL.IN-REC-love-NEG  
'we don't love each other'

b.  $\overleftarrow{\text{nã-}\text{nã}^{\text{i}}\text{-}\text{nõ-hẽ}'\text{nõ}^{\text{i}}}$   
1PL.IN-REC-call-NEG  
'we don't call each other'

(16)  $\overleftarrow{\text{nã-}\text{nã}^{\text{i}}\text{-}\text{nõ-hẽ}'\text{n}^{\text{d}}\text{u}^{\text{i}}}$   
NEG-1PL.IN-REC-listen-NEG  
'we don't listen to each other'

# The status of nasal-oral stops

- I propose \*NV: underlying nasal consonants cannot be followed by an oral vowel.
- \*NV ≫ \*CONTOUR predicts post-oralization of underlying nasal consonants before an oral vowel.

(17)

<u>/mimi/</u> 'radiant'	*NV	ID-σ(NAS)	ALN-L(NAS)	*Ṽ	ID(NAS)	*CNTR
a. <u>mimi</u>	*!		*			
b. m <sup>b</sup> <u>im</u> <sup>b</sup> i			*!			**
c. <sup>←</sup> m̄im <sup>b</sup> i				*	*	*

→ Supported by previous work (Stanton 2017).

# Directionality of nasalization

- Unclear if nasalization spreads in both directions from nasal vowels.
  - in all data so far, the trigger of nasalization has occurred word-finally.
- Nasal-oral stops show that Guarani nasal spread is **directional** (hence ALIGN-L(NASAL)).

(18) a.  $\overleftarrow{\text{ñãn}}^{\text{d}}\text{e-}[\text{j}]\text{a}'\text{gwa}$   
 1PL.IN-dog  
 'our dog'

b.  $\overleftarrow{\text{ñẽ-m}}^{\text{b}}\text{araka}[\text{j}]\text{a}$   
 2SG-cat  
 'your cat'

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## Nasalization in suffixes

- Recall that prefixes are clear targets of regressive nasalization, for both nasal vowel and nasal consonant triggers.

(19) a.  $\underline{\underline{n^d}}$ a- $\underline{\underline{j}}$ a- $\underline{\underline{j}}$ o-ha<sup>i</sup>hu-<sup>i</sup>  
NEG-1PL.IN-REC-love-NEG

'we don't love each other'

b.  $\overleftarrow{\underline{\underline{n\tilde{a}}-\underline{\underline{n\tilde{a}}-\underline{\underline{n\tilde{o}}-h\tilde{e}'n\tilde{o}^{-i}}}}$   
1PL.IN-REC-call-NEG

'we don't call each other'

- ★ However, new fieldwork data I collected shows clear asymmetries between prefixes and suffixes.
- ★ This challenges the  $\acute{\sigma}$ -positional faithfulness analysis proposed for roots and prefixes by Beckman 1998.
- Such analysis that stressed and unstressed suffixes are different in nasality/nasalization, due to IDENT- $\acute{\sigma}$ (NASAL).

# Nasalization in suffixes

## 1. Unstressed suffixes are contrastively oral/nasal.

→ they also fail to regressive nasalize preceding roots and prefixes.

(20) a. a-ja'po-mā  
 1 SG-work-CMPL  
 'I already worked'

d. e-'ju-nā  
 IMP-come-REQ  
 'please come!'

b. \*a-ja'po-m<sup>b</sup>a

e. \*e-'ju-n<sup>d</sup>a

c. \*ā-nā'po-mā

f. \*ē-'nū-nā

# Nasalization in suffixes

- ★  $\sigma$  positional faithfulness incorrectly predicts that unstressed suffixes neutralize their oral/nasal contrast.

	/a-japo-mã/ 'I already worked'	ID- $\sigma$ (NAS)	ALN-L(NAS)	* $\tilde{V}$	ID(NAS)
(21)	a. $\overleftarrow{\text{ã-nãpõ-mã}}$	*!		****	***
	☹ b. a-japo- $\overleftarrow{\text{mã}}$		****	*!	
	☹ c. a-japo-m <sup>b</sup> a		****		*

→ prefer candidates with less nasal vowels (c over b on \* $\tilde{V}$ ).

## Nasalization in suffixes

- But,  $\sigma$ -positional faithfulness makes the right predictions for *stressed* nasal suffixes.
  - they fail to neutralize oral/nasal contrast
  - and they fail to nasalize preceding roots and prefixes.

(22) a.  $\overleftarrow{\text{h-}\underline{\text{ẽn}}^{\text{d}}\text{-}'\underline{\text{ĩ}}}$   
 3POSS-listen-PRV  
 'deafness'

b. \* $\overleftarrow{\text{h-}\underline{\text{n}}\underline{\text{ũ}}\text{-}'\underline{\text{ĩ}}}$

(23) a.  $\text{o-}\underline{\text{j}}\underline{\text{eh}}\underline{\text{u}}\text{-}\overleftarrow{\text{r}\underline{\text{o}}}$   
 3-happen-if  
 'if it happens'

b. \* $\overleftarrow{\text{o-}\underline{\text{n}}\underline{\text{ẽh}}\underline{\text{ũ}}\text{-}'\underline{\text{r}\underline{\text{o}}}}$



# Nasalization in suffixes

## 2. Preceding unstressed suffixes fail to nasalize even when a nasal suffix follows it.

(24) a.  $\overleftarrow{\text{che-si-pe-gũã rã}}$   
 1SG-mother-DOM-for  
 'for my mother'

c.  $\overleftarrow{\text{a-ja'po-ta-mã}}$   
 1SG-work-FUT-CMPL  
 'I will already work'

b. \* $\overleftarrow{\text{che-si-pẽ-gũã rã}}$

d. \* $\overleftarrow{\text{a-ja'po-tã-mã}}$

(25) a.  $\overleftarrow{\text{mĩtã-}} \text{'}\eta^{\text{g}}\text{uera-n}^{\text{d}}\text{i}$   
 child-PL-with  
 'with the children'

b. \* $\overleftarrow{\text{mĩtã-}} \text{'}\eta^{\text{g}}\text{uerã-n}^{\text{d}}\text{i}$

# Nasalization in suffixes

- ★  $\sigma$ -positional faithfulness incorrectly predicts that unstressed suffixes are targets of nasalization.

/che-si-pe-guarã/ 'for my mother'	ID- $\sigma$ (NAS)	ALIGN-L(NASAL)	* $\tilde{V}$	ID(NAS)
a. che-si-pe-guara	*!			*
b. $\overleftarrow{\text{ch\~e-s\~i-p\~e-g\~u\~a\~r\~a}}$	*!		*****	
☛ c. $\overleftarrow{\text{che-si-pe-g\~u\~a\~r\~a}}$		**	***	*****
☹ d. $\overleftarrow{\text{che-si-pe-g\~u\~a\~r\~a}}$		***!	**	****

- Not the case when preceding suffix is stressed: protected by IDENT- $\sigma$ (NASAL).

# Roadmap

1. Language background and basic phonology
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4. **Analysis**
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# Goals for the analysis

- Two problems with  $\sigma$ -positional faithfulness that require fixing:
  1. All suffixes retain oral/nasal contrast regardless of stress.
  2. All suffixes fail to undergo nasalization from other suffixes.
- I propose two new mechanisms to predict suffix independence:
  1. **Right-edge faithfulness**: nasality is specified (faithful) at the right edges of words.
  2. **Output-output Correspondence** (Benua, 2000): language's cyclic morphological structure forces suffix-internal spread of nasalization.
- These will be added to the existing  $\sigma$ -positional faithfulness analysis.  
→ which we will reevaluate later on.

# Right-edge faithfulness

- ★ Prevent suffixes from neutralizing via high-ranked faithfulness at the right edges of words.

## (27) IDENT-R(NASAL)

Assign a violation to each candidate whose rightmost segment doesn't have identical specification for nasality as its corresponding input segment.

(28)

/a-japo-mã/ 'I already worked'	ID-R(NAS)	ID-σ(N)	ALN-L(N)	*Ṽ	ID-(N)
a. $\overleftarrow{\text{ã-nãpõ-mã}}$		*!		****	***
b. a-japo- $\overleftarrow{\text{mã}}$			****	*!	
c. a-japo-m <sup>b</sup> a	*!		****		*

## Right-edge faithfulness

- Unstressed bisyllabic suffixes are similarly protected from neutralization.

→ they also trigger suffix-internal regressive spread.

- (29)  $\overleftarrow{\text{chẽ-r-ẽ}^{\text{n}^{\text{d}}}\text{u-rãmõ}}$   
 1SG-POSS-listen-if  
 ‘if you hear me’

(30)

/che-r-enu-ramõ/ ‘if you hear me’	ID-R(N)	ID-σ(N)	ALN-L(N)	*Ṽ	ID(N)
a. che-r-en <sup>d</sup> u-ramõ			9!	1	
b. che-r-en <sup>d</sup> u-ram <sup>b</sup> o	*!		9		1
c. $\overleftarrow{\text{chẽ-r-ẽnũ-rãmõ}}$		*!		5	6
☞ d. $\overleftarrow{\text{chẽ-r-ẽn}^{\text{d}}\text{u-rãmõ}}$			4	5	5

# Output-output correspondence

- ★ Protect preceding suffixes from nasalization via output-output correspondence (Benua, 2000).

## (31) OO-IDENT(NASAL)


Assign a violation to each segment in an output whose specification for nasality is not identical to its corresponding segment in the base.

(32)

/che-si-pe-guarā/ 'for my mother' BASE: (che-si-pe)	ID-R(N)	<b>OO-ID(N)</b>	ID-σ(N)	ALN-L	*V̄	ID(N)
a. che-si-pe-guar <u>ā</u>	*!		*			*
b. che-si-pe- <u>g</u> uā <u>ā</u>				***	**	***
c. che-si-pe- <u>g</u> uā <u>ā</u>		*!		**	***	****

# Output-output correspondence

- Suffixes show cyclic morphological structure.
- Prefixes can theoretically be ordered anywhere in the derivation.
- ★ ALIGN-L(NASAL) will require left-aligned nasalization even if prefixes aren't in the base of correspondence.

	/ja-jo-henōi-se/ 'we want to call e.o.' BASE: (hēnō <sup>ī</sup> )	ID-R(N)	<b>OO-ID(N)</b>	ID-σ(N)	ALN-L	*V̄	ID(N)
(33)	a. ja-jo-hēnō <sup>ī</sup> -se				* ***	1	1
	b.  nā-nō-hēnō <sup>ī</sup> -se					4	5
	c. ja-jo-hen <sup>d</sup> o <sup>i</sup> -se		*	*	***		1



# Output-output correspondence

- ★ But, prefixes should be ordered first in the derivation to avoid the “missing base” problem (Benua 2000).
- The base of correspondence must be a legal output in the language

(34) a.  $\overleftarrow{\text{nã-nõ-hẽnõ}^{\bar{1}}}$ - $\overleftarrow{\text{'se-mã}}$   
 1PL.IN-REC-CALL-DES-CMPL  
 ‘we already want to call  
 each other’

b. Illegal base:  
 $*\text{hẽnõ}^{\bar{1}}$ -‘se

Legal base:  
 $\text{nã-nõ-hẽnõ}^{\bar{1}}$ -‘se

# Interim summary

- I introduced two new mechanisms added to the existing analysis of  $\sigma$  positional faithfulness.
  1. **Right-edge faithfulness:** IDENT-R(NASAL)  
→ prevents the neutralization of nasality in unstressed suffixes.
  2. **Transderivational faithfulness:** OO-IDENT(NASAL)  
→ prevents suffixes from nasalizing other preceding suffixes.
- But, ***there are crucial redundancies*** with  $\sigma$  positional faithfulness.  
→ Ultimately, I argue that  $\sigma$  positional faithfulness is both unsupported and unnecessary.

# Removing $\acute{o}$ positional faithfulness

**Redundancy 1:** IDENT-R(NASAL) and IDENT- $\acute{o}$ (NASAL).

- Completely overlap in their violations in any form with a final lexically stressed syllable (roots, forms with a final stressed suffix).
  - stress is overwhelmingly final in Guarani.
- Assuming stress is always right-aligned, roots and final suffixes no longer need the protection of IDENT- $\acute{o}$ (NASAL).

# Removing $\acute{\sigma}$ positional faithfulness

**Redundancy 2:** OO-IDENT(NASAL) and IDENT- $\acute{\sigma}$ (NASAL).

- Nasalization of any preceding stressed syllable already violates both OO-IDENT(NASAL) and IDENT- $\acute{\sigma}$ (NASAL).

(35)

/che-r- <u>en</u> -ramō/ BASE: [ēn <sup>d</sup> u]	ID-R(N)	OO-ID(N)	ID- $\acute{\sigma}$ (N)	ALN-L	* $\bar{V}$	ID(N)
a. $\overleftarrow{\text{chē-r-ēnū-rāmō}}$		*!	*		5	6
b. $\overleftarrow{\text{chē-r-ēn}}^{\text{d}}\overleftarrow{\text{u-rāmō}}$				4	4	5

## Removing $\sigma$ positional faithfulness

★ Not entirely clear if stress is indeed lexically specified: it's overwhelmingly final in Guarani.

- But, it seems to be...

1. Guarani has a few words with non-final stress, and a handful of stress-based minimal pairs.

(36)	a.	a'va	b.	'ava	(37)	a.	e <sup>i</sup> ra	b.	e'ira
		'person'		'hair'			'wild cat'		'honey'

(38)	a.	a'pe	b.	'ape	(39)	a.	mbo'i	b.	'mbo <sup>i</sup>
		'surface'		'here'			'to undress'		'snake'


## Removing $\acute{o}$ positional faithfulness

2. Suffixes are "stressable" or "unstressable" in an unpredictable manner.
  - another asymmetry between prefixes and suffixes: prefixes are never stressed.
- This leaves us with an interesting conundrum...
- Suffixes are the only morphemes that require a true lexical specification for stress.
  - assuming that minimal pairs and others are exceptions.
- But, suffixes fail to show  $\acute{o}$ -positional faithfulness
- $\acute{o}$ -positional faithfulness would gain more support if the morphemes that require lexical stress are also those that show  $\acute{o}$ -positional faithfulness.

# Removing $\sigma$ positional faithfulness

- ★ Investigate prediction of proposed analysis for morphemes with non-final stress vs. analysis with only  $\sigma$  positional faithfulness.
- Consider hypothetical input CVC $\tilde{V}$ :

(40)

	/CVC $\tilde{V}$ /	ID-R(NAS)	ID- $\sigma$ (NAS)	ALIGN-L(NAS)	* $\tilde{V}$	ID(NAS)
w/ 	a. <u>CVC</u> $\tilde{V}$			*	*	
	b. <u><math>\tilde{V}</math>C</u> $\tilde{V}$		*!		**	*
	c. <u>CVC</u> V	*!				*

## Removing $\acute{o}$ positional faithfulness

- ★ Investigate prediction of proposed analysis for morphemes with non-final stress vs. analysis with only  $\acute{o}$  positional faithfulness.
- Consider hypothetical input CVC $\tilde{V}$ :

(41)

	/ <u>CVC</u> $\tilde{V}$ /	ID-R(NAS)	ID- $\acute{o}$ (NAS)	ALIGN-L(NAS)	* $\tilde{V}$	ID(NAS)
w/ $\rightarrow$	a. <u>CVC</u> $\tilde{V}$			*!	*	
w/o $\rightarrow$	b. <u><math>\tilde{V}</math>C</u> $\tilde{V}$		*		**	*
	c. <u>CVC</u> V	*!				*

→ with IDENT- $\acute{o}$ (NASAL): word-internal disagreement in nasality

→ without IDENT- $\acute{o}$ (NASAL): full agreement in nasality



# Removing $\acute{o}$ positional faithfulness

- Consider another hypothetical input, C $\tilde{V}$ CV:

(42)



	/C $\tilde{V}$ CV/	ID-R(NAS)	ID- $\acute{o}$ (NAS)	ALIGN-L(NAS)	* $\tilde{V}$	ID(NAS)
a.	C $\tilde{V}$ CV				*	
b.	C $\tilde{V}$ C $\tilde{V}$	*!			**	*
c.	CVCV		*!			*

→ with IDENT- $\acute{o}$ (NASAL): word-internal disagreement in nasality

# Removing $\acute{o}$ positional faithfulness

- Consider another hypothetical input, C $\tilde{V}$ CV:

(43)

	/C $\tilde{V}$ CV/	ID-R(NAS)	ID- $\acute{o}$ (NAS)	ALIGN-L(NAS)	* $\tilde{V}$	ID(NAS)
w/ 	a. C $\tilde{V}$ CV				*!	
	b. C $\tilde{V}$ C $\tilde{V}$	*!			**	*
w/o 	c. CVCV		*			*

→ with IDENT- $\acute{o}$ (NASAL): word-internal disagreement in nasality

→ without IDENT- $\acute{o}$ (NASAL): full agreement in nasality

## Removing σ positional faithfulness

- ★ Guarani lexicon has ~14 words with non-final stress that distinguish analyses with and without σ-positional faithfulness (Estigarribia 2020).

(44)	a.	<i>hiká</i> <u>n</u> <i>ji</i>	freq. aspect	<i>má</i> <u>r</u> <i>a</i> <u>m</u> <i>o</i>	`never'
		<i>hí</i> <u>n</u> <i>a</i>	prog. aspect	<i>mé</i> <u>n</u> <i>a</i>	`husband'
		<i>ká</i> <u>m</u> <i>a</i>	`scrabies'	<i>nahá</i> <u>n</u> <i>iri</i>	`no'
		<i>limé</i> <u>t</u> <i>a</i>	`bottle'	<i>ne</i> ' <i>í</i> <u>r</u> <i>a</i>	`yet'
		<i>mamá</i> <u>á</u> <i>n<i>e</i></i>	`papaya'	<i>pohá</i> <u>n</u> <i>o</i>	`cure'
		<i>má</i> <u>v</u> <i>a</i>	`who'	<i>tē</i> <u>r</u> <i>a</i>	`or'
	b.	<i>á</i> <u>n</u> <i>ga</i>	`soul'	<i>té</i> <u>n</u> <i>ge</i>	`slowly'

## Removing $\sigma$ positional faithfulness

- Guarani lexicon has a few words with non-final stress that distinguish analyses with and without  $\sigma$ -positional faithfulness (Estigarribia 2020)

a.	<i>hiká</i> <u>n</u> <i>ji</i>	freq. aspect	<i>má</i> <u>r</u> <i>a</i> <u>m</u> <i>o</i>	`never'
	<i>hí</i> <u>n</u> <i>a</i>	prog. aspect	<i>mé</i> <u>n</u> <i>a</i>	`husband'
	<i>ká</i> <u>m</u> <i>a</i>	`scrabies'	<i>nahá<u>n</u><i>iri</i></i>	`no'
	<i>limé<u>t</u><i>a</i></i>	`bottle'	<i>ne</i> ' <u>t</u> <i>ira</i>	`yet'
	<i>mamá<u>n</u><i>e</i></i>	`papaya'	<i>pohá<u>n</u><i>o</i></i>	`cure'
	<i>má</i> <u>v</u> <i>a</i>	`who'	<i>té<u>r</u><i>a</i></i>	`or'

b.	<i>á</i> <u>n</u> <i>ga</i>	`soul'	<i>té<u>n</u><i>ge</i></i>	`slowly'
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- find full nasal consonants to the right of the stressed syllables.
- so, **rightmost syllable must be fully nasal.**

## Removing $\sigma$ positional faithfulness

- But, rightmost syllables in these words could be nasal due to **bidirectional** spread from the stressed syllable.
- I argue that Guarani **does not show bidirectional spread**.
  - Nasal-oral stops show that spread is directional:  $\overleftarrow{\text{pãnã}^{\text{b}}\text{i}}$  'butterfly'
  - This would leave Guarani 3 different nasalization processes...
    1. bidirectional nasalization for surface nasal consonants
    2. regressive nasalization for surface nasal-oral stops
    3. progressive nasalization
  - Nasal-oral stops and nasal consonants would require different URs
    - but these are in complementary distribution.

# Removing $\sigma$ positional faithfulness

b. *ánga* ‘soul’      *téngē* ‘slowly’

- Stressed syllable clear target of regressive nasalization when followed by a nasal-oral stop.
- More clearly observed when these forms have prefixes to their left.

(46) a.  $\tilde{n}\tilde{a}\tilde{n}\tilde{d}$ e-jagua  
1 PL.IN-dog  
‘our dog’

b.  $\overleftarrow{\tilde{n}\tilde{a}\tilde{n}\tilde{e}}$ -‘ $\tilde{a}$ nga  
1 PL.IN-soul  
‘our soul’

- ★ ***Stressed syllables cannot be protected by IDENT- $\sigma$ (NASAL)***, since they would fail to nasalize in presence of nasal-oral stop trigger.

# Interim summary

- Proposed right-edge faithfulness + OO-Correspondence analysis explains the independence of suffixes in nasality and nasalization.
- An analysis with **solely** these mechanisms additionally predicts nasalization pattern in roots with non-final stress.
  - they show full agreement in nasalization that may only be attributed to right-edge faithfulness.

# Roadmap

1. Language background and basic phonology
2.  $\acute{o}$  positional faithfulness in roots and prefixes (Beckman 1998)
3. Nasality and nasalization in suffixes
4. Analysis
  - Right-edge faithfulness + OO-correspondence
  - Reevaluating  $\acute{o}$  positional faithfulness
5. **Progressive harmony**
6. Discussion
  - Typology of prefix-suffix asymmetries
  - A possible prosodic analysis
  - Dialectal variation in progressive harmony



# Progressive nasalization

- Guarani also has a system of progressive (rightward) nasalization that is very different from regressive.

	<b>Regressive</b>	<b>Progressive</b>
Triggers	rightmost nasal vowels, nasal consonants	nasal vowels
Targets	voiced segments	voiceless stops
Locality	local	non-local
Productivity	productive, exceptionless	lexically-specific

(47)

- ★ I'll show that the proposed IDENT-R(NASAL) & OO-IDENT(NASAL) analysis is compatible with progressive harmony.
  - progressive nasalization as phonologically conditioned suppletive allomorphy (Russell 2021).

# Progressive nasalization

- Often described as phonological conditioned suppletive allomorphy:
1. Only a handful of stop-initial morphemes undergo progressive harmony alternations

(48) a. jagua-<sup>1</sup>**[k]**uera  
dog-PL  
'dogs'

b. <sup>←</sup>mĩtã-<sup>1</sup>**[ŋ<sup>9</sup>]**uera  
child-PL  
'children'

(49) a. a-ka<sup>1</sup>ru-**[t]**a  
1SG-eat-FUT  
'I will eat'

b. <sup>←</sup>ã<sup>1</sup>-pĩtĩ<sup>1</sup>võ-**[t]**a  
1SG-help-FUT  
'I will help'

# Progressive nasalization

## 2. Morpheme targets are affected differently by progressive nasalization.

(50) a. o-karu-pa  
 3-eat-TOT  
 'he finished eating'

b.  $\overleftarrow{\text{o-n\~e}}$ -m<sup>b</sup>a  
 3-talk-TOT  
 'he finished talking'

(51) a. plasa-pe  
 plaza-LOC  
 'at the plaza'

b.  $\overleftarrow{\text{k\~o}s\~i}$ -n\~a-me  
 kitchen-LOC  
 'at the kitchen'

→ **phonologically conditioned:**

- nasal roots select for nasal-initial allomorphs
- oral roots select for oral-initial allomorphs

# Progressive nasalization

- Progressive harmony only triggered by phonemic nasal vowels.

(52) a.  $\overleftarrow{\text{pānāmbi}}\text{'[k]uera}$   
butterfly-PL  
'butterflies'

b. \* $\overleftarrow{\text{pānāmbi}}\text{'[ŋ]uera}$

- Alternations may stack and occur non-locally.

(53) a. o-karu-se- $\overleftarrow{\text{pa}}$ - $\overleftarrow{\text{po}}$ 'ta- $\overleftarrow{\text{pe}}$ ve  
3-eat-DES-TOT-INCIP-until  
'until he is about to finish  
wanting to eat'

b.  $\overleftarrow{\text{õ-ně'ẽ}}$ -se- $\overleftarrow{\text{m}^b}$ a- $\overleftarrow{\text{m}^b}$ o'ta- $\overleftarrow{\text{mēvẽ}}$   
3-talk-DES-TOT-INCIP-until  
'until he is about to finish  
wanting to talk'

# Progressive nasalization

- Verbal and nominal roots also show lexically-specific progressive harmony alternations.
- Examples from compounds:

(54)	a.	o- <sup>←</sup> [k̃ɪ]	b.	<sup>←</sup> h-ãse- <sup>←</sup> [ŋ̃ɟɪ]	c.	<sup>←</sup> hũ- <sup>←</sup> [ŋ̃ɟɪ]	d.	<sup>←</sup> ãmã- <sup>←</sup> [ŋ̃ɟɪ]
		3-rain		3POSS-rain		black-rain		rain-rain
		'it rains'		'weep'		'grey, brown'		'rain'

# Progressive nasalization

- Examples from causative constructions:

(55) a. o-**[p̃]**a<sup>i</sup>  
 3-wake.up  
 'woke up'

b. ã-m**õ**-**[m̃]**a<sup>i</sup>      diego-pe  
 3-CAUS-wake.up    Diego-DOM  
 'he woke up Diego'

- Also lexically specific: causatives otherwise follow the general pattern of regressive nasalization.

(56) a.  $\overleftarrow{\text{ã-m}^{\text{b}}\text{o-pu}^{\text{p}}\text{pu}}$   
 1SG-CAUS-hot  
 'I boiled your water'

b.  $\overleftarrow{\text{ã-m}^{\text{õ-kānē}}\text{'ō}}$   
 1SG-CAUS-tired  
 'I made (someone) tired'

# Progressive nasalization

★ Two possible analyses for causative constructions.

1. Nasal-initial allomorph exceptionally selected regardless of nasality of causative prefix.

(57) a.  $\overleftarrow{\text{õ-mõ-}}\mathbf{m}^b\text{a}^i$   
3-CAUS-wake.up

2. Causative prefix is exceptionally nasal and selects for nasal-initial root allomorphs.

(58) a.  $\overleftarrow{\text{õ-mõ-}}\boxed{\mathbf{m}^b}\text{a}^i$   
3-CAUS-wake.up

★ Alternative 2 is more compatible with analysis of progressive harmony in suffixes.

→ *phonologically conditioned*: phonemic nasal vowel selects nasal-initial allomorphs

# Progressive nasalization

- ★ **Major takeaway:** IDENT-R(NASAL) and OO-IDENT(NASAL) make the right predictions for progressive harmony (as allomorphy).
- No suffix-external regressive nasalization even when nasal allomorph is selected.
- Allomorphs follow the general phonotactic restrictions: regressive nasal spread, nasal-oral stop / nasal consonant alternations, etc.



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6. **Discussion**
  - Typology of prefix-suffix asymmetries
  - A possible prosodic analysis to suffix independence
  - Dialectal variation in progressive harmony

# Typology of prefix-suffix asymmetries

- Crosslinguistically, prefix independence is more common than suffix independence (Hyman 2008; Elkins 2020).
  - Guarani shows a case of **suffix** independence
- Often attributed to a natural bias towards **initial prominence** (Elkins 2020)
  - segmental contrasts generally preserved in prominent positions
  - phonological processes triggered in prominent positions
  - phonological processes are blocked in prominent positions
- Of course, such analysis is impossible for Guarani
- Instead, suffix independence in Guarani comes from right-aligned specification in nasality and cyclic morphological structure.
- So, Guarani has a special place in the typology of prefix-suffix asymmetries.

# Typology of prefix-suffix asymmetries

- ★ Guarani is typologically interesting in other ways as well.
- Heavily prefixing and suffixing language with both leftward and rightward nasalization.
  - expression of these systems not limited by morphological structure
- A counterexample to generalization that languages with both prefixing and suffixing show **bidirectional** spread (Baković 2000).
  - Guarani regressive and progressive nasalization are entirely different processes.
- Additional prefix-suffix asymmetry in lexical specification for stress.
  - suffixes are “stressable” or “unstressable”, but prefixes can never be stressed.

# A possible prosodic analysis

- Proposed analysis recruits **morphophonological mechanisms** to account for prefix-suffix asymmetry: OO-Correspondence
- Prefix-suffix asymmetries also often assumed to stem from asymmetries in **prosodic structure**.
  - affixes that exhibit phonological independence are outside the prosodic domain within which expected processes are active.
- ★ Prosodic analysis for Guarani asymmetry is possible, but only when assuming **recursive**.

# A possible prosodic analysis

- **Non-recursive** prosodic analysis:

$$(59) \quad [ \overleftarrow{P - R} ]_{\omega} - [ \overleftarrow{S}_1 ]_{\omega} - [ \overleftarrow{S}_2 ]_{\omega} - [ \overleftarrow{S}_3 ]_{\omega}$$

→ roots and prefixes in same domain  $\omega$

→ domain of ALIGN-L(NASAL) and IDENT-R(NASAL) are the  $\omega$

- ★ Suffixes don't seem to form their prosodic words in Guarani

→ a good number are monosyllabic and unstressed

- **Recursive** prosodic analysis:

$$(60) \quad [ [ [ \overleftarrow{P - R} ]_{\omega} - \overleftarrow{S}_1 ]_{\omega} - \overleftarrow{S}_2 ]_{\omega} - \overleftarrow{S}_3 ]_{\omega}$$

# A possible prosodic analysis

- Recursive self-embedding not universally accepted: each prosodic word could condition different phonotactics (Vogel 2009).
- Often offered as an alternative when morphophonological analysis encounters the “missing base problem” (Mascaró 2016; Bennett 2018)
  - but morphophonological analysis works for Guarani, assuming prefixes are ordered first in the derivation.
- ★ Not committed to morphophonological analysis.
  - prosodic analysis possible, but full range predictions should be evaluated
  - still need right-edge faithfulness (and not IDENT- $\sigma$ (NASAL)) regardless!

# Dialectal variation in progressive harmony

- Asunción and Concepción speakers show less progressive harmony alternations compared to Coronel Oviedo speakers.

## **C.O. speakers:**

(61) a.  $\overleftarrow{\tilde{o}\text{-}\tilde{n}\tilde{e}}\tilde{e}\text{-se-}\boxed{m^b}a\text{-}\boxed{m^b}o\text{'ta-}\overleftarrow{m\tilde{e}}\tilde{v}\tilde{e}$   
 3-talk-DES-TOT-INCIP-until  
 'until he is about to finish  
 wanting to talk'

## **Asu / Con speakers:**

b.  $\overleftarrow{\tilde{o}\text{-}\tilde{n}\tilde{e}}\tilde{e}\text{-se-}\boxed{p}a\text{-}\boxed{p}o\text{'ta-}\boxed{p\tilde{e}}\tilde{v}\tilde{e}$   
 3-talk-DES-TOT-INCIP-until  
 'until he is about to finish  
 wanting to talk'

- But, **only in suffixes**.
- Otherwise, they show alternations in roots (compounds, causatives, etc.) consistent with Coronel Oviedo speakers.

# Dialectal variation in progressive harmony

- Asunción and Concepción speakers may also show variation within the same form.

(62) a. jagua-kuera-pe  
 dog-PL-DOM  
 'dogs'

b.  $\overleftarrow{\text{mĩtã}}$ -ŋ<sup>g</sup>uera-pe  
 child-PL-DOM  
 'children'



# Dialectal variation in progressive harmony

- Dialectal variation potentially serves as evidence for suffix independence being **generalized** from regressive harmony to progressive.
  - suffixes are increasingly faithful regardless of nasality of preceding elements.
  - both in regressive and progressive harmony
- However, this could also be attributed to **unproductivity** of progressive harmony.
  - but, wouldn't explain why suffixes, and not roots, show lack of progressive harmony alternations.
- No comprehensive studies on dialectal variation of Guarani yet - more work is needed of course!

# Closing

- I proposed an updated analysis of Guarani nasality and nasalization, based on original fieldwork data.
- Suffixes in Guarani show **independence** from the general phonology of roots and prefixes.
- I take this as evidence that:
  1. Guarani nasality is faithful at the right edges of words, as opposed to at stressed syllables.
  2. Guarani has cyclic morphological structure for suffixes.
- Further evidence for right-edge faithfulness: nasal roots with non-final stress
- (potential) further evidence for general suffix independence: dialectal variation in progressive harmony.

# Closing

***Aguyjevete!***

Thank you!

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# Appendix

- σ-positional faithfulness also predicts suffix-internal spread of nasalization.
- More clearly observed in bisyllabic nasal suffixes.

(63) a. n<sup>d</sup>a-ikatu-mō̃'ā̃-ī̃  
NEG-1SG-able-NEG.FUT-NEG  
'I won't be able to'

b. re-ju-vā̃'ē'ṛā̃  
2SG-come-must  
'you must come'

(64)

/n-a-ikatu-mō̃'ā̃-ī̃/ 'I won't be able to'	ID-σ(NAS)	ALN-L(NAS)	*Ṽ	ID(NAS)
a. n <sup>d</sup> -a-ikatu-m <sup>b</sup> o'ā̃-ī̃		9!	1	
b. n <sup>d</sup> -a-ikatu- <u>m</u> ō̃'ā̃-ī̃		4	2	*
c. n-ā̃-īkātū-mō̃'ā̃-ī̃	*!		5	****
d. n <sup>d</sup> -a-ikatu-m <sup>b</sup> o'ā̃-ī̃	*!	4		*

# Progressive nasalization

- What makes the nasal allomorph of the causative prefix control for allomorphy selection of roots?

1. It is stressed, and stressed syllables select nasal allomorphs  
→ it is only the root that selects nasal allomorphs in suffixes.

(65) a.  $\overleftarrow{\text{o-ñe}}\text{'ē-se-m}^{\text{b}}\text{a-}'\text{ta-mēvē}$   
 3-talk-DES-TOT-INCIP-until  
 'until he is about to finish  
 wanting to talk'

2. Morphological structure: rightmost elements selects nasal allomorphs  
→ prefixes are never the rightmost element: they are added first in the derivation