Intonation and meaning

EGG 2024 in Braşov

Deniz Özyıldız
Universität Konstanz

https://deniz.fr/summers/egg2024/

Yesterday:
Pitch accents, edge tones and notation.

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And a big unresolved question…

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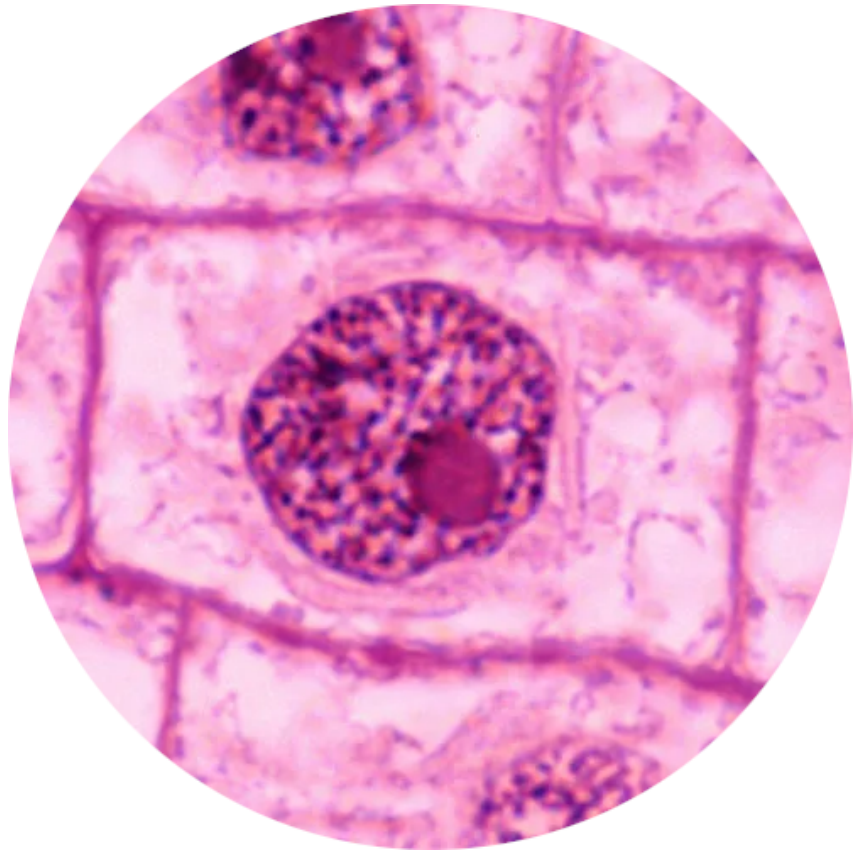

Yesterday:
Pitch accents, edge tones and notation.
At least in simple cases, the Nuclear Pitch Accent has a default position.

(1) a. Barbara hat gestern ihre BLUMEN gegossen.
b. Barbara watered her PLANTS yesterday.

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At least in simple cases, the Nuclear Pitch Accent has a default position.

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Today:

- ✧ Wrapping up the pre- and post-nuclear fields.
- ✧ Background on Optimality Theory.
- ✧ A simple hypothesis about the syntax to prosody mapping.

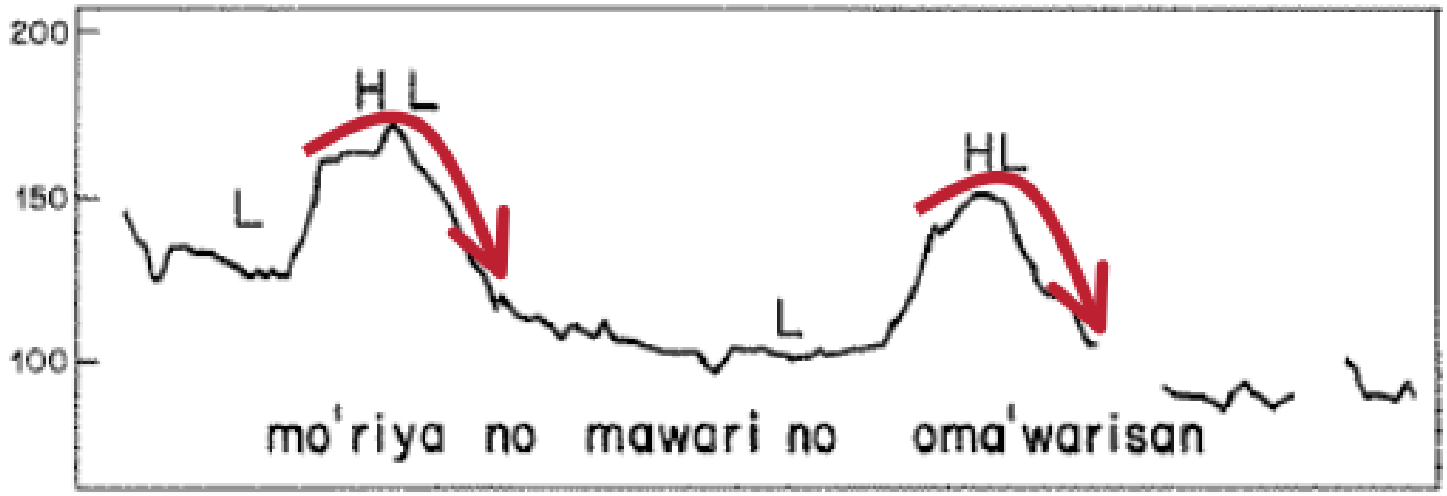
  Much of this is based on Büring (2016).

Outline

A canonical bitonal event

Loose end from yesterday

Figure 21. Sample pitch track of a Japanese phrase that shows the realization of an HL tone unit. From Beckman & Pierrehumbert (1986:264).

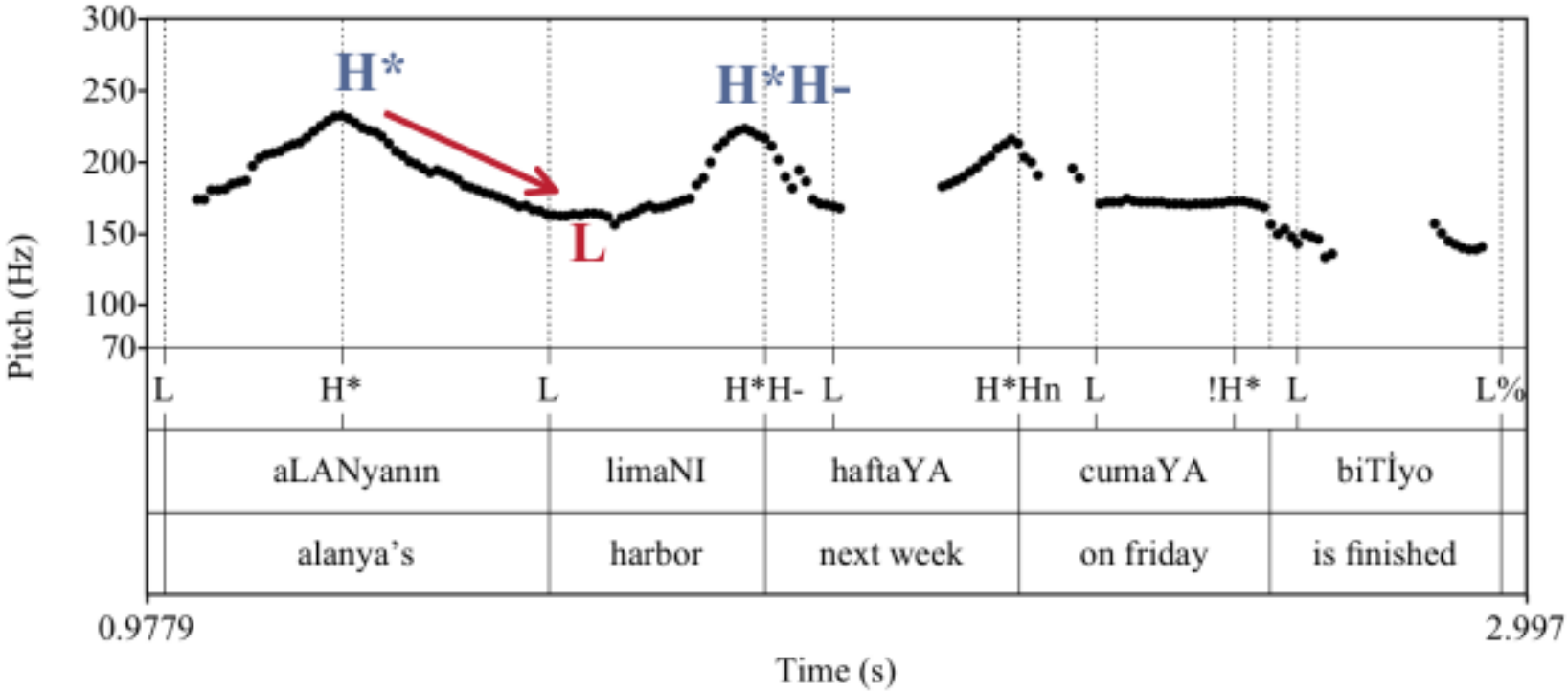


a bitonal H*L, via İpek 2015

(2) Korewa [Moriya no mawari no omawarisan] hanasi desu.
story Moriya GEN around GEN police officer story be
This is a story of police officers around Moriya.
Takanobu Nakamura (p.c.)

as opposed to a sequence of monotonal events

Loose end from yesterday



a sequence of H* and L, from İpek 2015

We saw the NPA in a default position.

But that default can be overridden, e.g., because of focus, givenness, etc.

(3) a. BARBARA watered her plants yesterday.
b. Barbara WATERED her plants yesterday.
c. . . .

The pre- and post-nuclear fields

Material that linearly…

- …precedes the nucleus is ‘pre-nuclear.’
- …follows the nucleus is ‘post-nuclear.’

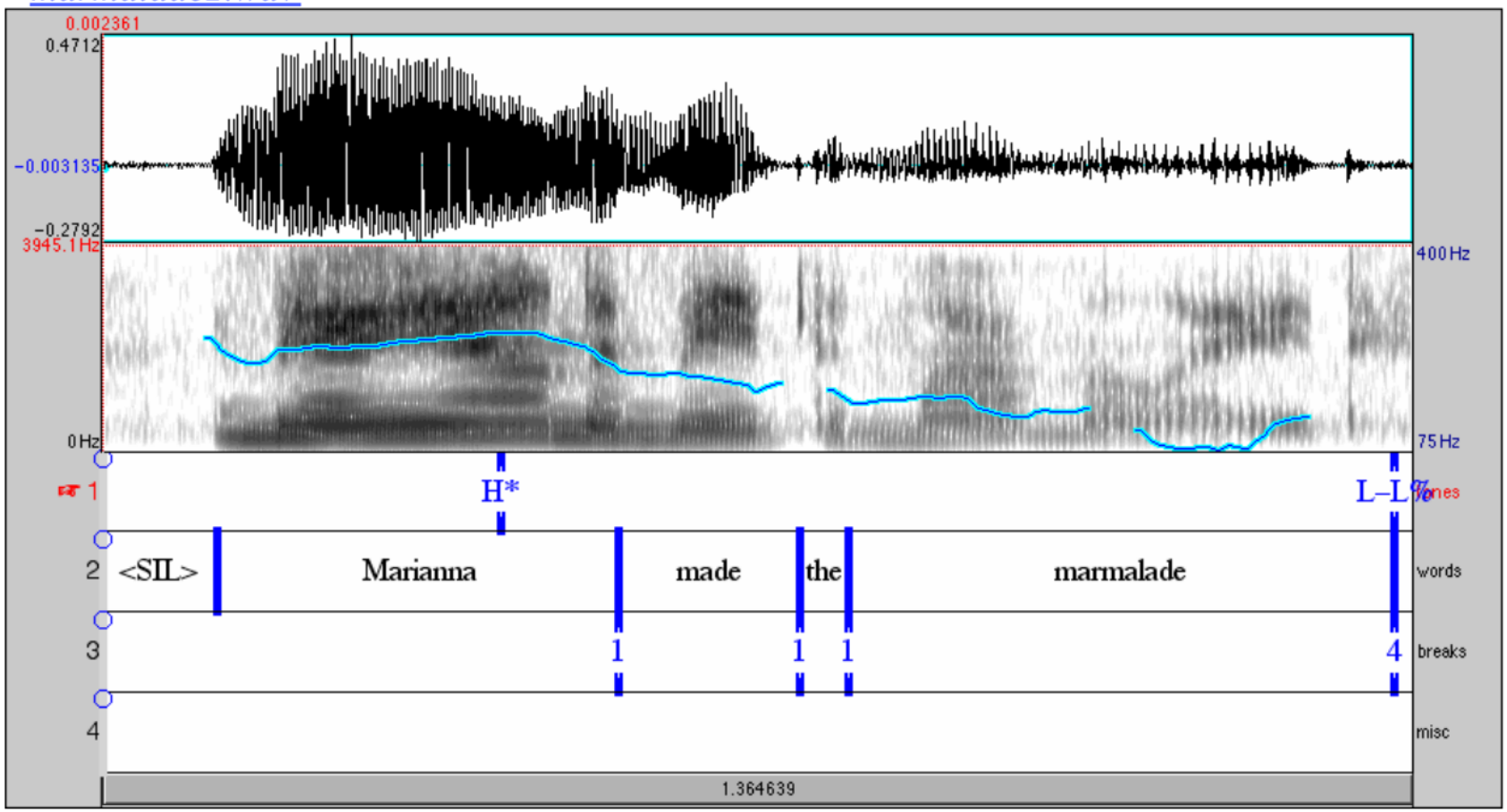
Material in the pre-nuclear field is accented and phrased regularly.

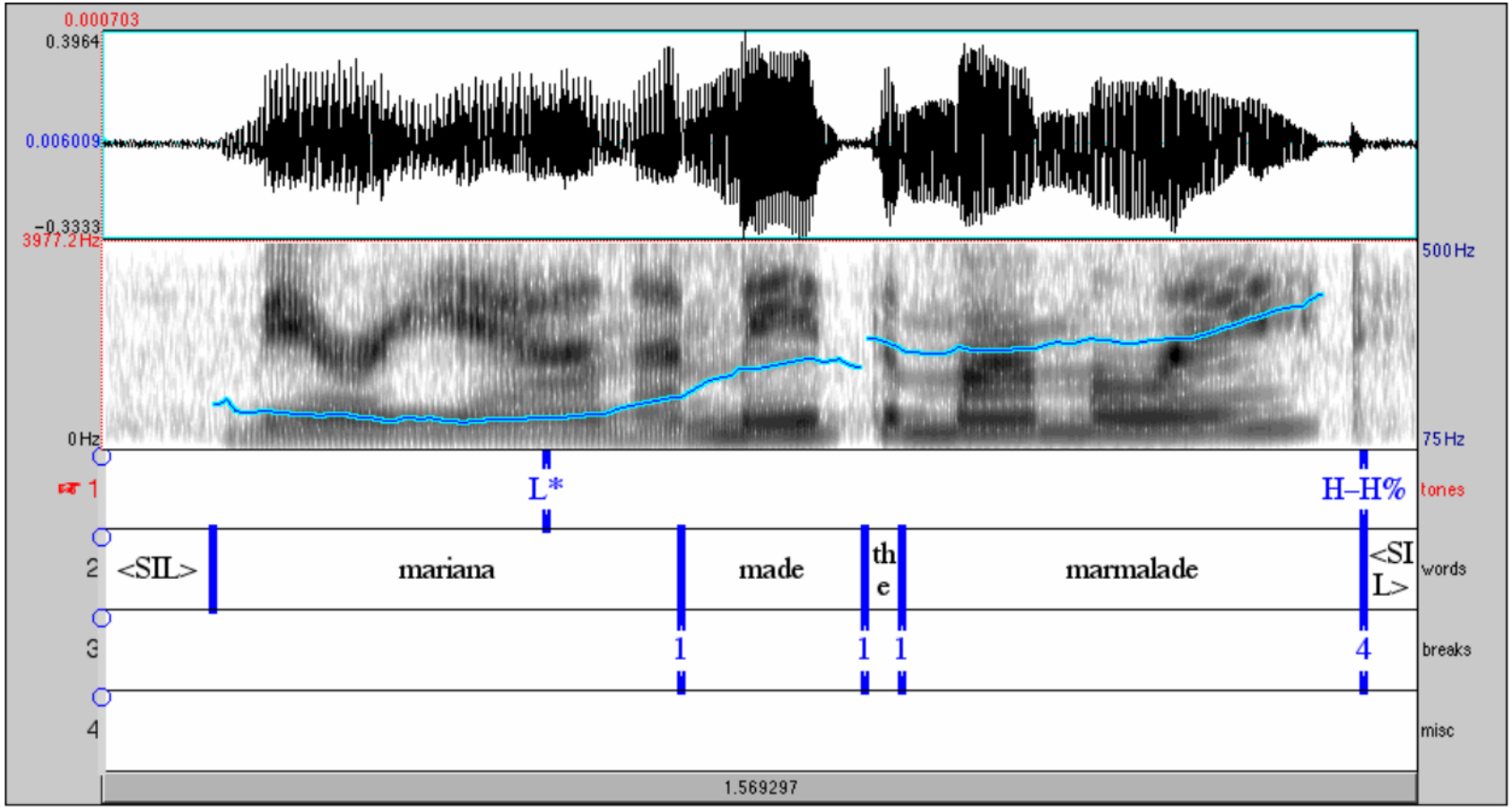
Material in the post-nuclear field is…

- deaccented,
- possibly phrased with the nucleus.

(see Ladd 2005: 143–147)

Figure 2.3.2 A single H* in an intonational phrase with the same words as Figure 2.3.1 <*marmalade2.wav*>

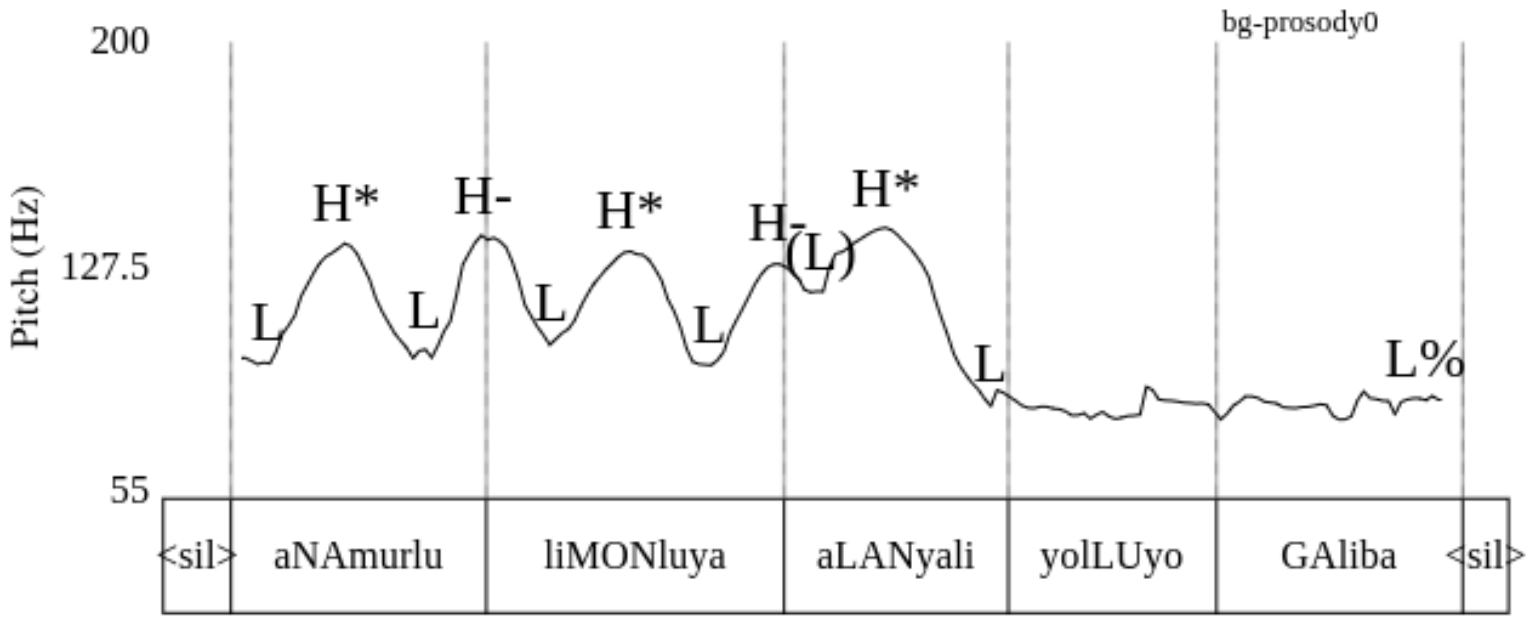



0.000703
0.3964
0.006009
-0.3333
3977.2Hz
0Hz
500Hz
75Hz
1
tones
L*
H–H%
2
<SIL>
mariana
made
th
e
marmalade
<SI
L>
words
3
1
1
1
4
breaks
4
misc
1.569297

(6) (What's going on?)

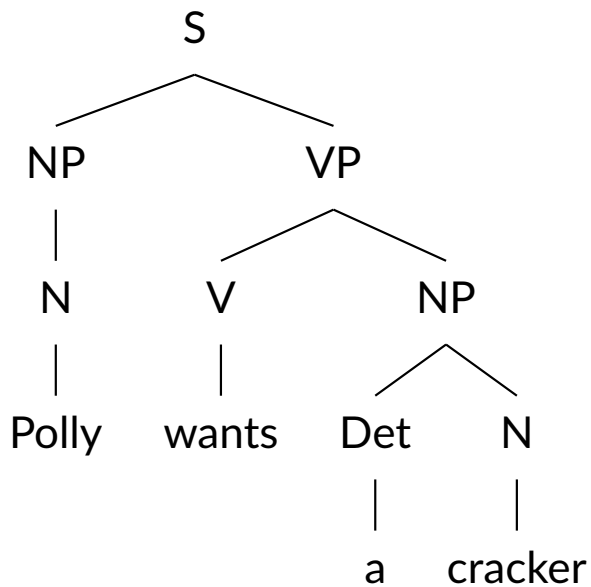
a. anámurlu limónluya alányali yollúyor gáliba
(( )Φ ( )Φ ( )Φ)I
Anamur.DEM Limonlu.DAT Alanya.DEM send ADV
The person from Anamur is sending people from Alanya to Limonlu, I think.

b. Pitch track for 6a



Outline

Refresher on syntax



$[[\text{Polly}]_{\text{NP}}\ [\text{wants}\ [\text{a cracker}]_{\text{NP}}]_{\text{VP}}]_{\text{S}}$

Refresher on Optimality Theory (OT)

We often observe changes happening to the same item.

(4) a. çek-ecek 'it will pull'
b. çak-acak 'it will strike'
c. The future suffix: {-ecek, -acak} Turkish

Then, we posit an underlying and various surface forms:

(5) a. Underlying: -acak
b. Surface: {-acak, -ecek}

We now want to talk about the relationship between the two…

Refresher on Optimality Theory (OT)

One way of analyzing the Turkish situation is to say that the language has a **constraint**.

(6) BACKNESS HARMONY
All vowels in a suffix match in backness with the last one in the stem it attaches to.

In general, in the language, the vowels…

- a, ı, o, u are followed by -acak back vowels
- e, i, ö, ü are followed by -ecek front vowels

and words must do as best as they can to obey the constraint.

Refresher on Optimality Theory (OT)

One way of analyzing the Turkish situation is to say that the language has a **constraint**.

(6) BACKNESS HARMONY
All vowels in a suffix match in backness with the last one in the stem it attaches to.

So when we want to say “it will pull” or “it will strike” we have four logically possible options.

(7) a. çak-acak ‘it will strike’
b. çak-ecek

(8) a. çek-acak
b. çek-ecek ‘it will pull’

Refresher on Optimality Theory (OT)

One way of analyzing the Turkish situation is to say that the language has a **constraint**.

(6) BACKNESS HARMONY
All vowels in a suffix match in backness with the last one in the stem it attaches to.

But only two are acceptable:

(7) a. çak-acak 'it will strike'
b. *çak-ecek

(8) a. *çek-acak
b. çek-ecek 'it will pull'

The reason is: the starred forms violate BACKNESS HARMONY.

Refresher on Optimality Theory (OT)

Languages have many constraints that enforce different things.

Some are more important to satisfy than others.

(9) FAITHFULNESS TO INPUT:
Every segment in a surface form is the same as the corresponding segment in the underlying form.

The form in (10) satisfies this constraint.

(10) çak-acak “it will strike”

The form in (11) violates it twice.

(11) çek-ecek ‘it will pull’

So, shouldn’t it be ungrammatical?

Refresher on Optimality Theory (OT)

Constraints are ranked, and are violable.

/çek-acak/	BACKNESS HARMONY	FAITHFULNESS TO INPUT
çek-acak	*!*	
☞ çek-ecek		**

- In Turkish, it is more important to change a vowel to satisfy harmony, than to be faithful to the input.
- And even though the winning candidate is not perfect, it is better than its competitor wrt these constraints.
- Symbols:
  - ☞ designates the winner
  - Asterisks (*) count violation marks
  - The ! marks the point at which a candidate loses.

Refresher on Optimality Theory (OT)

underlying representations

$\Downarrow$

generation of candidate surface forms

$\Downarrow$

evaluation wrt a set of constraints

$\Downarrow$

selection of the optimal surface form(s)

We want to apply all of this to prosody:
Given an input form (syntax + other things), predict an output form (intonational structure).

For more on OT, see:

$\Rightarrow$ John McCarthy (2008)
Doing Optimality Theory: Applying Theory to Data

Outline

Predicting intonation contours

Desideratum

Given as input syntactic structure + focus and givenness marking:

(12) $[[\texttt{vincent}]^{\texttt{NP}}\ [\texttt{loves}^{\texttt{V}}\ [\texttt{massachusetts}]^{\texttt{NP}}_{\texttt{F}}]^{\texttt{VP}}]^{\texttt{S}}$

We want an algorithm that outputs intonational structures.

(13)
```
      PA T-          PA     T-%
vincent loves massachusetts
```

With `PA` standing in for Pitch Accent, and `T-` for H or L.
Which *particular* tones get filled in, we'll not worry about.

Metrical structure

Metrical ≈ rhythmic, like in some poetry

We first need to represent stress.
Stress at the word level can be represented as in (14):

(14)

a.	`(  x  )`	word
b.	`(x )(x )`	foot
c.	`(x )(x )(x )(x )`	syllable
d.	`ma ssa chu setts`	

- ✧ Each `x` is a **beat**.
- ✧ Parentheses indicate prosodic constituents.
- ✧ Each beat marks the **head** of the constituent it's on.
- ✧ The height of the columns indicate relative strength.

Metrical structure

Metrical ≈ rhythmic, like in some poetry

(14)

a.	`(  x  )`	word
b.	`(x  )(x  )`	foot
c.	`(x )(x )(x )(x )`	syllable
d.	ma ssa chu setts	

We'll treat these structures as *given* to us.
We don't say maSSAchusetts. So we don't have the structure:

bad

a.	`(  x  )`	word
b.	`(  x  )(x  )`	foot
c.	`(x )(x )(x )(x )`	syllable
d.	ma ssa chu setts	

Metrical structure

Some simplified rules for constructing metrical grids

(14)

a.	`(  x  )`	word
b.	`(x  )(x  )`	foot
c.	`(x )(x )(x )(x )`	syllable
d.	`ma ssa chu setts`	

Exactly one head per constituent!

bad

a.	`(  )`	word
b.	`(x  x  )(x  )`	foot
c.	`(x )(x )(x )(x )`	syllable
d.	`ma ssa chu setts`	

Metrical structure

Some simplified rules for constructing metrical grids

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b.	`(x  )(x  )`	foot
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d.	`ma ssa chu setts`	

Parse everything.

bad

a.	`(  x  )`	word
b.	`(x  )(x  )`	foot
c.	`(x )(x  )(x  )`	syllable
d.	`ma ssa chu setts`	

Metrical structure

Some simplified rules for constructing metrical grids

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a.	`(  x  )`	word
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d.	`ma ssa chu setts`	

A beat can only be placed on top of another beat.

bad

a.	`(  x  )`	word
b.	`(x )( )`	foot
c.	`(x )(x )(x )(x  )`	syllable
d.	`ma ssa chu setts`	

What would metrical grids look like for…

(15) a. Braşov
b. Romania
c. purgatory

Metrical structure above the word

Metrical structure above the word functions similarly.

We'll simplify the preceding into (16).

(16) a. `(  x  )` word
b. `massachusetts`

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And turn to the association of higher level prosodic constituents

(17)
```
(                    x     )   int. phrase
(    x  )(           x     )   phon. phrase
(    x  )(  x  )(    x     )   word
 vincent  loves  massachusetts
```

Metrical structure above the word

Metrical structure above the word functions similarly.

We'll simplify the preceding into (16).

(16) a. `(  x  )` word
b. `massachusetts`

And turn to the association of higher level prosodic constituents and their association with intonation.

(17)

```
      PA  T-              NPA   T-%
(                          x     )      int. phrase
(    x  )(                 x     )      phon. phrase
(    x  )(  x  )(          x     )      word
 vincent  loves  massachusetts
```

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```
      PA  T-              NPA   T-%
(                          x     )      int. phrase
(    x  )(                 x     )      phon. phrase
(    x  )(  x  )(          x     )      word
 vincent  loves  massachusetts
```

We want to to generate representations like (17). But how?

Predicting intonation contours

Desideratum

Given as input syntactic structure + focus and givenness marking:

(18) $[[\texttt{vincent}]^{\texttt{NP}}\ [\texttt{loves}^{\texttt{V}}\ [\texttt{massachusetts}]^{\texttt{NP}}_{\texttt{F}}]^{\texttt{VP}}]^{\texttt{S}}$

We want an algorithm that outputs intonational structures.

(19)

```
      PA T-          PA     T-%
vincent loves massachusetts
```

Metrical and intonational structure above the word

Component 1:
From input, generate a set of (possibly wild) candidate structures.

C1

```
a.                          NPA    T-%
b.   (                      x       )
c.   (                      x       )
d.   (    x  )(  x  )(      x       )
e.    vincent  loves  massachusetts
```

C2

```
a.        NPA         T-        PA    T-%
b.   (    x                           )
c.   (    x       x  )(       x       )
d.   (    x       x  )(       x       )
e.    vincent  loves  massachusetts
```

etc.

Metrical and intonational structure above the word

Component 2:
Assume a set of constraints (ranked, violable).

An example:

(20) WRAP-XP:
Every syntactic phrase XP is contained within a phonological phrase.

"Assign one violation mark per XP that is not contained within a phonological phrase."

(21) ✓ ( )$_{\Phi}$
[loves [Massachusetts]$_{NP}$]$_{VP}$

* ( )$_{\Phi}$ ( )$_{\Phi}$
[loves [Massachusetts]$_{NP}$]$_{VP}$

Metrical and intonational structure above the word

Component 3:
Tally up candidates' violation marks and select the optimal ones.

How many violations of WRAP-XP?
input: `[[vincent] [loves [massachusetts]]]`

possible output:

C1	a.		NPA	T-%	
	b.	(	x	)	
	c.	(	x	)	ph. phrase
	d.	(x)(x)(	x	)	
	e.	vincent loves massachusetts			

Metrical and intonational structure above the word

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Tally up candidates' violation marks and select the optimal ones.

How many violations of WRAP-XP?
input: `[[vincent] [loves [massachusetts]]]`

possible output:

C1	a.		NPA T-%	
	b.	(	x)	
	c.	(	x)	ph. phrase
	d.	(x)(x)(	x)	
	e.	vincent loves massachusetts		

None!

Metrical and intonational structure above the word

Component 3:
Tally up candidates' violation marks and select the optimal ones.

How many violations of WRAP-XP?
input: `[[vincent] [loves [massachusetts]]]`

possible output:

C2	a.			NPA				T-				PA		T-%	
	b.	(		x										)	
	c.	(		x			x	)(			x			)	ph. phrase
	d.	(		x			x	)(			x			)	
	e.			vincent			loves				massachusetts				

Metrical and intonational structure above the word

Component 3:
Tally up candidates' violation marks and select the optimal ones.

How many violations of WRAP-XP?
input: `[[vincent] [loves [massachusetts]]]`

possible output:

C2	a.		NPA			T-		PA	T-%	
	b.	(	x						)	
	c.	(	x		x	)(		x	)	ph. phrase
	d.	(	x		x	)(		x	)	
	e.		vincent		loves			massachusetts		

One! (The VP isn't contained in a ph. phrase.)

Getting more realistic

WRAP-XP only enforces phonological phrase boundaries.

We need *other constraints* to capture stress, accents, alignment, . . .

Let's start with WRAP-XP + two more.

Stress-XP

(20) STRESS-XP:
Evey syntactic phrase XP contains a phonological phrase-level stress.

"Assign one violation mark per XP that does not contain a phonological phrase-level stress."

✓	a.	(x)(x)(x)	ph. phrase
	b.	(x)(x)(x)	
	c.	vincent loves massachusetts	
✓	a.	(x)(x)	ph. phrase
	b.	(x)(x)(x)	
	c.	vincent loves massachusetts	
*	a.	(x)	ph. phrase
	b.	(x)(x)(x)	
	c.	vincent loves massachusetts	

Note

We continue parsing these structures into iPs and add pitch accents freely.

Here is one way of doing this:

(21)

```
a.                              PA    T-%
b.  (                           x       )     int. phrase
c.  (    x  )(  x  )(           x       )     ph. phrase
d.  (    x  )(  x  )(           x       )
e.   vincent  loves  massachusetts
```

Stress to Accent

(22) STRESS TO ACCENT:
The last pitch accent (if there is any) within a prosodic constituent is on the head of that constituent.

"Assign one violation mark per accent that is to the right of one that is on a head."

✓	a.	PA	
	b.	(x)(x)	ph. phrase
	c.	(x)(x)(x)	
	d.	vincent loves massachusetts	
*	a.	PA	
	b.	(x)(x)	ph. phrase
	c.	(x)(x)(x)	
	d.	vincent loves massachusetts	

(23) WRAP-XP:
Every syntactic phrase XP is contained within a phonological phrase.

"Assign one violation mark per XP that is not contained within a phonological phrase."

(24) STRESS-XP:
Evey syntactic phrase XP contains a phonological phrase-level stress.

"Assign one violation mark per XP that does not contain a phonological phrase-level stress."

(25) STRESS TO ACCENT:
The last pitch accent (if there is any) within a prosodic constituent is on the head of that constituent.

"Assign one violation mark per accent that is to the right of one that is on a head."

Suggested ranking:
STRESS TO ACCENT >> STRESS-XP >> WRAP-XP

Exercise

What are some metrical and intonational structures that our constraints predict for:

(26) a. [see [the sun]]
b. [[die Sonne] sehen]

(27) a. [[einem Freund] [ein Bier] bestellen]
b. [order [a friend] [a beer]]

(Square brackets suggest syntactic parse.)

- Generate a parse, figure out which constraints it violates and how many times.
- It's always good to look for outputs that satisfy the constraints, but that are not acceptable.

[see [the sun]$_{NP}$]$_{VP}$	STRESS TO ACCENT	STRESS-XP	WRAP-XP
PA PA (x)$_{iP}$ (x x)$_{phP}$ (see)(the sun)	*!		
☞ PA (x)$_{iP}$ (x)$_{phP}$ (see)(the sun)			
PA (x)$_{iP}$ (x)(x)$_{phP}$ (see)(the sun)			*!
...			