Lecture 1

1. What is the reason that no word with the pronunciation [bɛd] exists in Dutch? Do you expect a language change that makes possible such a word? What about the opposite pattern in English (disappearing of [bɛd])?
2. Construct the optimality tableaux for the voicing contrasts in Dutch using the lexical inputs /bɛd-ən/ and /bɛt-ən/ (and considering the output candidates [bɛ.dən] and [bɛ.tən]!)
3. Given the system of constraints {FAITH , ONSET, NOCODA}, what is the optimal analysis for the input /tatata/? Why is the result independent on the ranking of the constraints?
4. Assume the ranking FAITH>>ONSET, NOCODA. What is the optimal analysis for /əmerikə/? And what is the optimal analysis if we assume *Senufo*'s ranking NOCODA, ONSET >> FAITH?
5. Allow the Generator to realize more than one consonant at onset and coda. Furthermore, add the following two new constraints:
   Onsets must increase and codas decrease in sonority SONORITY
   Syllables have at most one consonant at an edge *COMPLEX

   Use the ranking SONORITY >> FAITH >> ONSET, NOCODA, *COMPLEX

   a. What are the optimal outputs for /silindricl/ and /hAmstə/?
   b. Why [tank] is a possible (optimal) output but [takn] is not?
   c. Likewise, why [twin] is well-formed but [tkin] is not?
6. Consider some of the *contact handshapes* in Taiwan Sign Language (TSL) listed here and combined with a straightforward code:


(123)


(13)


(12)

The numbers correspond to the fingers: 1 = thumb, 2 = index, 3 = middle,…
Some of the fingers of the hand are *in contact.* These fingers are assumed to be "selected", the others are "unselected". The selected fingers are indicated in the code, e.g. (123).
For simplicity, we assume a very small space of potential "signs", namely {(1,2), (1,3), (1,2,3)}.

This set forms the input set and the output set of an OT systems. Assume further that GEN is totally free and pairs each input with each output. Next, consider the following "empirical generalizations":

1. each "sign language" realizes the sign described as (123)
2. when a sign language realizes (1,3) then it realizes (1,2)

Construct an OT system that deals with these "observations"!

Hint: make use of the markedness constraints INDEX and MIDDLE demanding the selection of the index finger and the middle finger, respectively. Assume a fixed (universal) ranking INDEX o MIDDLE. Discuss the factorial typology involving FAITH!

7. Construct the optimality tableaux for the voicing contrasts in Dutch using the lexical inputs /bɛd-ən/, /bɛt-ən/, /bɛd/ and /bɛt/. Instead of using the contextual markedness constraint CODA/*VOICE use the simpler constraint

*VOICE**:** *Obstruents must not be voiced.*

As an additional constraint use 'positional faithfulness':

FAITH[VOICE, ONSET]**:** *An output segment in the ONSET has the same value for VOICE as its input correspondent*.

Which ranking of the three constraints

FAITH[VOICE]
FAITH[VOICE, ONSET]
* VOICE

has to be assumed for Dutch? What might be the intuition behind positional faithfulness? What happens when *VOICE outranks the two faithfulness constraints?

Lecture 2

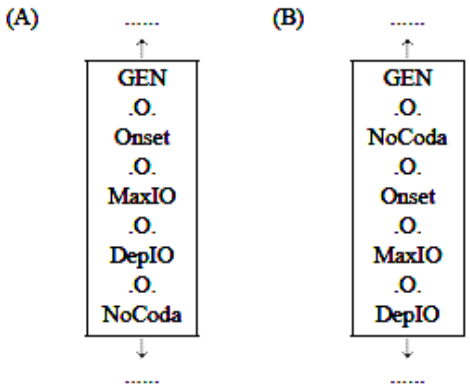
8. Discuss stress assignment for the input /mi.nχ.so.tχ/. Consider the listed candidate outputs only.

Input: /mi.nə.so.tə/		ROOT	WSP	TROCH	PARSE SYLL
1	(mí.nə)(só.tə)				
2	mi(n´ə.so)tə				
3	mi.nə(só.tə)				
4	(mí.nə)so.tə				
5	Mi(nə.só)tə				
6	(mi.n´ə)(só.tə)				
7	(mi.n´ə)só.tə				
8	mi.nə.so.tə				

9. Treat the syllabification of *hotél* and *vánity*!

Note: The following three exercises address the syllabification example (second part of lecture 2)

10. The following two **lenient** cascades should be applied to the input 'bab'. Pretend you could see every intermediate step in the cascade and list the set of remaining candidates after each constraint application (ignore the intermediate stage after applying only GEN).



Hint: the result of [GEN .O. Onset] applied to 'bab' can be read off slide 20 (why?). Applying [GEN .O. NoCoda] to 'bab' leads to the following alternatives:

X[b]N[a]N[]X[b]	O[]X[b]N[a]X[b]	N[]O[b]N[a]X[b]
X[b]N[a]O[b]N[]	O[b]N[a]N[]X[b]	N[]X[b]N[a]X[b]
X[b]N[a]X[b]	O[b]N[a]O[b]N[]	
X[b]N[a]X[b]N[]	O[b]N[a]X[b]	
X[b]N[]N[a]X[b]	O[b]N[a]X[b]N[]	
X[b]O[]N[a]X[b]	O[b]N[]N[a]X[b]	

11. What would be a possible phonetic realization of the winning candidate for (B) in exercise 10? Assuming a suitable "phonetic filter" FST added by composition at the bottom, what happens if the augmented (B)-FST is run in the opposite direction (presented with the phonetic output form as input)?
    What would have to be done to implement interpretive optimization (e.g., for lexicon optimization) – rather than running the given lenient cascade in (B) (implementing expressive optimization) from bottom to top? How would the behaviour change when again applied to the phonetic output form resulting as the optimal candidate for 'bab'?
12. (Back to simple expressive optimization.) If we wanted to include the possibility for complex onsets and codas (as in English [$_{\sigma}$ stamp]) – how would we have to modify the definition of *Gen*?
    How would you formalize the constraints *COMPLEX ^{Ons} and *COMPLEX^{Cod} (which should have the obvious effect)?

Lecture 3

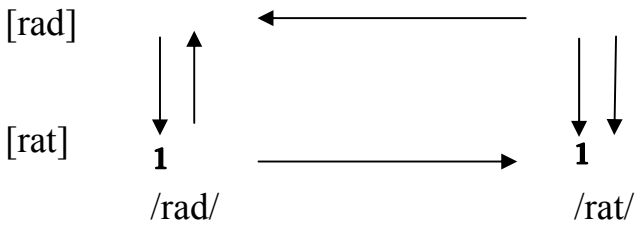
13. In Section 1 of this lecture we have seen how the ranking for *Hawaiian* and *Senufo* can be learned by using constraint demotion (triggering data pairs /atat/ - .a.ta.+t, for *Hawaiian*, and /atat/ - .9a.ta.+t, for *Senufo*). Are the triggering data pairs /atat/ - .9a.tat. (*Yawelmani*) and /atat/ - .a.tat. (*English*) sufficient for learning the correct rankings of the relevant constraints (basic syllable structure)?
14. Consider the overt form *tat* as input for the OT learning algorithm (Section 4). Start with the initial ranking ONSET, NOCODA >> FAITH. What is the resulting ranking after presenting the learner with the overt form *tat*?
    Hint: Remember that the OT learning algorithm combines robust interpretive parsing and constraint demotion. For robust interpretive parsing assume that *tat* can be parsed into (i) .tat. (with underlying form /tat/), (ii) .tat.<a>. (with underlying form /tata/), (iii) <a>.tat. (with underlying form /atat/).
15. In section 5 we investigated constraints on inventories by lexicon optimization. Use the OT learning algorithm (Section 4) and find out which inventory is established if the

system is presented (a) with the input [t], (b) with the input [d], (c) with the inputs [t], [d]. Assume that the generator pairs {/t/, /d/} freely with {[t], [d]}, and the initial hierarchy is **OBS/*VOICE >> FAITH[VOICE]**.

16. In *Imbura Quechua*, a language of Northern Equador, there are three voiceless stops: [p, t, k]. Except for a class of word borrowed from Spanish, voiced stops are not found contrastively in *Quechua.* However, stops in *Quechua* are voiced when appearing after a nasal; e.g. /t/ [nan-da] 'road-ACC'. The general pattern of voicelessness for obstruents requires a ranking OBS/*VOICE >> FAITH[VOICE]. In order to describe the kind of assimilation involved, an constraint ICC[VOICE] has been introduced ('identical cluster constraint with regard to voicing'). How ICC[VOICE] must be ranked in order to explain the case of allophony found in *Quechua*? Complete the corresponding diagram!

[nan-ta]			
[nan-da]			
	/nan-ta/		

17. The Rad/Rat-Problem (cf. Hale & Reiss 1998). In German there are two possible lexical inputs /rad/ (meaning *wheel*) and /rat/ (meaning *advice*). With regard to the present account we have the following diagram of bidirection:



Investigate the two possible rankings between the Markedness constraint (arrows marked with 1 in the diagrams) and Faithfulness (the other arrows). List the pairings for the two possibilities and make clear why the expected *pattern of ambiguity* (i.e. the pairing [rat]-/rad/, [rat]-/rad/) cannot be realized by the present account without further provisos.

Lecture 4

18. Take the input
    {*write*(x,y), x=*Peter*, y=*what*, tense=future, auxiliary=*will*}
    Construct a representative number of possible outputs!
19. Investigate subject-auxiliary inversion! Give an OT analysis of the following English examples:
    - *What will Peter write*
    - **What Peter will write*
    - **Will Peter write what*
    - **Peter will write what*

    Hint: use the constraints OP-SPEC, OB-HD o STAY!
20. Consider the following early children questions:
    - *Where horse go?*

- *What cowboy doing?*

What about the initial ranking of the Child Grammar? (you have to include the faithfulness constraint FULL-INT)

21. Consider the garden-path sentence

- *Bill knew <u>John</u> liked Maria*

Give an analysis in terms of the Frazier model (using the OT formulation given in section 8) and compare it with the constraint theory of processing (section 9)!

22. Consider the following two sentences:

- *I gave her <u>earrings</u> to Sally*
- *I gave her <u>earrings</u> on her birthday*

Which of this two sentences exhibits a garden-path effect? Show that the prediction made by the model of Frazier (using the OT formulation given in section 8) are in conflict with the intuitions. What about the predictions of constraint theory of processing! [hint: allow a ternary branching structure for double object constructions]

Lecture 5

23. Consider the following sentences and determine the binding relations predicted by weak bidirectional OT using the constraints REFECON and BIND:

Often when I talk to a doctor$_i$,
(A) the doctor$_{\{i,j\}}$ disagrees with himself$_{\{i,j\}}$
(B) the doctor$_{\{i,j\}}$ disagrees with him$_{\{i,j\}}$

24. Consider Beaver's (to appear; in the reader) theory of local coherence, which is based on the following constraints:

PRO-TOP: The topic is pronominalized
COHERE: The topic of the current sentence is the topic of the previous one
ALIGN : The topic is in subject position

Ranking: PRO-TOP >> COHERE >> ALIGN

The *topic* of a sentence is defined as the entity referred to in both the current and the previous sentence, such that the relevant referring express-ion in the previous sentence was minimally oblique (if there is no such entity, the topic can be anything – for example in discourse initial sentences). Sentence topics are underlined in the following example:

Jane$_1$ is happy	< <u>1</u> >
Mary$_2$ gave her$_1$ a present$_3$	< 2 <u>1</u> 3 >
She$_{1/2}$ smiled	< <u>1</u> > / < <u>2</u> >

What is the optimal interpretation of the last sentence?
Finally, give an analysis of the following discourse:

Jane$_1$ is happy	< <u>1</u> >
Mary$_2$ gave her$_1$ a present$_3$	< 2 <u>1</u> 3 >
She$_{1/2}$ smiled at her$_{2/1}$	< 1 <u>2</u> > / < <u>2</u> 1 >

Lecture 6

25. Use penalty logic to formalize Rescher's Verdi-Bizet example: 'If Bizet and Verdi had been compatriots Bizet would have been Italian or Verdi would have been French'.

Hint: Use the (self-explaining) expressions I(v), F(b), COMP(v,b) $\leftrightarrow$ [(I(v)&I(b)) $\vee$ (F(v)&F(b))]

26. Prove the following fact: If Δ' is an *optimal scenario* of a formula α with regard to a penalty knowledge base <At, Δ, k>, then no model ν of α that verifies Δ' has a higher system energy $\mathcal{E}_{PK}(\nu)$ $(=_{def} \sum_{\delta \in \Delta} k(\delta)\, [\![\neg\delta]\!]_\nu)$ than any model of α that doesn't verify Δ'.