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# Exercise – GLA

## Due: April 10, 2008

### Materials

There are some extra materials at this website

<http://www.linguistics.ucla.edu/people/hayes/gla/>

### Helpful Readings

Please read the excerpt from the paper cited below (posted on class website), in order to understand how the GLA works.

- Extract (pp. 2-10) from: Paul Boersma and Bruce Hayes (2001) “Empirical Tests of the Gradual Learning Algorithm,” *Linguistic Inquiry* 32: 45-86.

You may also be interested in which applies the GLA to a real (as opposed to toy) language data: Hayes, Bruce and Zsuzsa Londe (2006) “Stochastic phonological knowledge: the case of Hungarian vowel harmony,” *Phonology* 23: 59-104.

### Exercise

Download the spreadsheet `GLAExercise.xls` from the course website. The spreadsheet looks like this. To avoid font issues, the file uses ad hoc symbols, translated below.

			*Gj	Agree(back)	*NC	Ident(voice)
			*Gj	Agree(back)	*NC	Ident(voice)
/aNki/ = [aŋki]	aNki = [aŋki]	40		1	1	
	aNkji = [aŋkʰi]	10	1		1	
	aNgi = [aŋgi]	40		1		1
	aNgji = [aŋgʰi]	10	1			1

The meaning of the third column is that in the language in question, the four outputs for the given input surface 40, 10, 40, and 10 percent of the time.

Assume constraints of the following type:

*G <sup>j</sup>	violated by all palatalized (i.e. fronted) velars
AGREE(BACK)	violated by all plain velars preceding a front vowel
*[+nasal][+cons,-voice] (*NC)	violated by all voiceless consonants following a nasal
IDENT(VOICE)	violated when /k/ changes to [g]

1. Before you run OTSoft, think about how to get these probabilities from a stochastic grammar. You should figure out the two pairwise ranking probabilities between constraints that are needed.
2. Using OTSoft, run the Gradual Learning Algorithm on the file, and verify that it can roughly match the percentages in the learning data. Provide a printout. Explain in qualitative terms how the ranking values accomplish this. Be specific: *how does the learned grammar derive 40/10/40/10?*
3. Visit the spreadsheet at

[http://www.linguistics.ucla.edu/people/hayes/gla/  
RankingValuesToProbabilities.xls](http://www.linguistics.ucla.edu/people/hayes/gla/RankingValuesToProbabilities.xls)

(look for **Utility**). Determine why the “ranking values” obtained by the Gradual Learning Algorithm match up (more or less) with those you obtained by reasoning in question #1. (You can find a setting of OTSoft that does this automatically, but I’d like you to consult the spreadsheet so this part is not like magic.)

## Suggestions

Here are suggested parameter settings for running the GLA on OTSoft. All are set from the GLA screen, which you get to see after clicking on the **Rank** button:

- From **Options**, select **Include pairwise ranking probabilities**. This gives you the probability that any one constraint will outrank any other, when the finished grammar is run on any given occasion. Inspecting this output is highly recommended.
- Set **Number of times to go through forms** at 100000, **Initial plasticity** at 2, **Final plasticity** at .0001, and **Number of times to test grammar** at 10000.