Class 4, 4/8/15: Model Evaluation; More on Iambic Pentameter

1. Course bureaucracy
   - Continu reading Hayes/Wilson/Shisko
   - Think about term paper projects — what data would you like to analyze? Make appt.

MODEL EVALUATION

2. Readings
   - This lecture summarizes Hayes, Wilson and Shisko (2012: 712-713)

3. Skill at hand
   - Use statistical testing to decide what constraints belong in a maxent grammar

4. Sample data
   - The Hausa mutadaarik meter presented as an exercise by Russ last time.

5. A possible coding of the data

```
--/--/--/--  6
--/--/--/vv-  0
--/--/vv/--/--  0
--/--/vv/--/vv-  2
--/vv/--/--/--  6
--/vv/--/vv-  1
--/vv/--/vv/-/-  7
--/vv/-/vv/-vv-  0
vv/--/--/--  1
vv/--/--/vv/-  2
vv/--/vv/-/-  3
vv/--/vv/-/vv-  0
vv/--/vv/-/vv/-  4
vv/--/vv/-/vv/-/vv-  0
vv/-/vv/-/vv/-/vv-  3
vv/-/vv/-/vv/-/vv-  1
```
6. Simplications (shameless, motivated by pedagogy)

- One line beginning v -:

∅ Shigaa wuta too sai zaalunci

 ➢ let’s just ignore it for now; it may be meaningful though since other Hausa poetry has lines beginning with “gaps”

- Let us ignore two false quantities:

  007b: Yaa kwantaą gadoo nai yai barcii should be light
  015a: Da rashin yarđa da fādar Allah should be heavy

7. Some constraints assumed to be infinite-weight

- Lines have four feet
- Feet are tetrapositional
- One mora per position
- Last two positions of foot must correspond to a heavy

With this, we can have a GEN of just 16 members (4 binary choices)

8. The distribution of the two foot types within the line in the sample

<table>
<thead>
<tr>
<th></th>
<th>Foot 1</th>
<th>Foot 2</th>
<th>Foot 3</th>
<th>Foot 4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>v v -</td>
<td>13</td>
<td>22</td>
<td>16</td>
<td>5</td>
<td>56</td>
</tr>
<tr>
<td>- -</td>
<td>22</td>
<td>14</td>
<td>20</td>
<td>30</td>
<td>86</td>
</tr>
</tbody>
</table>

9. My feelings when I eyeballed the data

- The two foot types compete rather equally.
- / - - / is dominant in the last foot.
- Nothing else leapt to mind.

10. Defn. Quantitative clausula

- A metrically-invariant or near-invariant sequence at or near the end of a line

  ➢ I learned this term from Roman Jakobson’s work (analysis of the Serbo-Croatian epic pentameter)
11. A constraint I feel pretty good about (empirically at least)

**Final Clausula:** The line must end in - -. 

12. Constraints I’m at least willing to toy with

**Medial Clausula:** the first half-line must end in v v -.
**Heavy Preference:** weakly prefer - to vv.

13. Setting up the spreadsheet

- Candidates — 16 of them
- Constraints (3) and violations
- Apparatus to calculate Harmony, eHarmony, Probability, and Plog, as before

14. Eight grammars

- Either include, or leave out, each of the three constraints.
- Yielding 8 plogs.

15. The eight grammars sorted by constraints they contain

<table>
<thead>
<tr>
<th>- -</th>
<th>Clausula HeavyPref</th>
<th>Medial Clausula</th>
<th>log likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>-89.18</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>-91.01</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>yes</td>
<td>-90.18</td>
</tr>
<tr>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>-91.08</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>-97.07</td>
</tr>
<tr>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>-92.80</td>
</tr>
<tr>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>-98.92</td>
</tr>
<tr>
<td>no</td>
<td>no</td>
<td>no</td>
<td>-99.81</td>
</tr>
</tbody>
</table>

16. The eight grammars sorted by plog

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- Obviously, the richest grammar has the highest plog.
- Yet it is also the most complex grammar — does use of all three constraints make it worth it?

17. The Likelihood Ratio Test

- Use it for comparing nested grammars — one grammar has a subset of the constraints of the other.
- Method:
  - Find the difference in plog.
  - Multiply this by two.
  - Look up the result in the chi distribution to obtain a p value.
  - Excel: =CHIDIST(2plogdiff, degfread)
    - 2plogdiff = twice the difference in plog
    - degfread = degrees of freedom, meaning difference in constraint population
  - Reckon the p-statistic as you will: probability that the improvement in grammar performance from adding the extra constraints is due to chance

18. Searching big constraint sets: Top down and bottom up

- Top down: start with the biggest grammar, progressively trim back constraints with the crummiest p-value. Stop when every constraint resists trimback at the significance level you want.
- Bottom up: start with the null grammar, progressively add in the constraint that tests with the best p-value.
- Applied to the 87-constraint system used by Hayes/Wilson/Shisko, top-down and bottom up yielded similar but not identical grammars.

19. Spreadsheet: implementing top-down and bottom-up for the mutadaarik

- Upshot: my “gut feelings” were right — only the final clausula constraint seems to be worthwhile.

LESS-OBVIOUS STUFF ABOUT PENTAMETER

20. Working more rigorously

- We linguists ought to be able to find subtler things, drawing our theoretical understanding of phonological structure and our practice in scrutinizing data with great care.
- This actually seems to have happened, mostly with the work of Paul Kiparsky in the 1970’s.
  - Stress, syntax and meter (1975), Language
  - The rhythmic structure of English verse (1977), Linguistic Inquiry
21. “Lexical” stress

- A stress is **lexical** if it is a stressed syllable of a polysyllabic word.
- Lexical stresses are regulated more tightly than other stresses (Kiparsky 1975)

This is clearly a complex line, but not all that unusual in Shakespeare:

Pluck the keen teeth from the fierce tiger’s jaws,

```
              w     s       w     s       w     s       w    s  w      s
```

This is a type of line Shakespeare virtually never writes:

*Pluck immense teeth from enraged tiger’s jaws,

```
              w    s      w       s         w   s    w     s  w      s
```

The difference is verified in Hayes/Wilson/Shisko’s maxent analysis.

- English does allow lexical mismatches in inversion — always after a phonological break.

Canker’d with peace, to part your canker’d hate.  

*Romeo and Juliet*

22. Variations on the lexical-inversion theme

- German and Russian verse permit inversion, but not initial **lexical** inversion.

```
               x                       x
.   x .   x   x .   x . .   x . .   x
            . x . x   . x . x . .   x
               x
               x .   x   x . .   x . .   x
*Und neuen Glanz ][ schöpf ich aus deinem Schatten
               . x . x   . x . x . .   x . .   x
               x
               x .   x   x . .   x . .   x
*Und neuen Glanz ][ schöpfen aus deinem Schatten
               . x . x   . x . x . .   x . .   x
```

‘and new luster I/to create from thy shadow’

- Milton every once in a while mismatches a lexical stress not after a break.¹

¹ The end of a long discourse; Adam addresses himself, realizing he has committed not just sin but original sin, dooming all of humanity.

References:

— Bjorklund, Beth (1978) *A study in comparative prosody : English and German jambic pentameter*
Thus, what thou desirest
   And what thou fear’st, alike destroys all hope
   Of refuge, and concludes thee miserable
   Beyond all past example and future.

but not at the end of a word, as in “immense teeth” (an endings-strict effect? more later)