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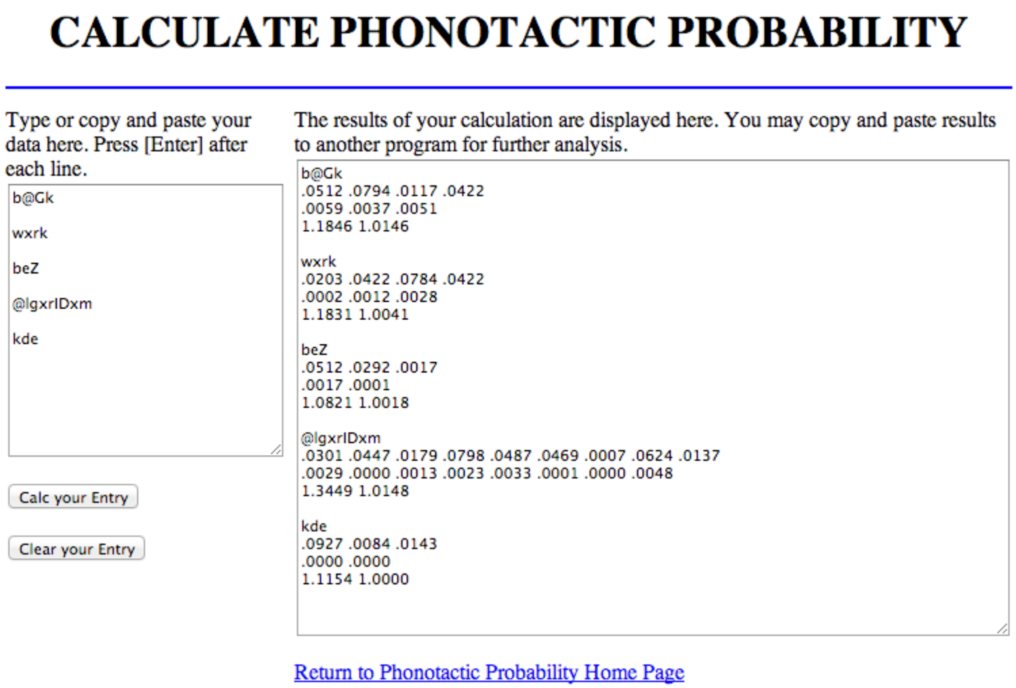
NE360/HS361
Lab 11: Due 12/10/13

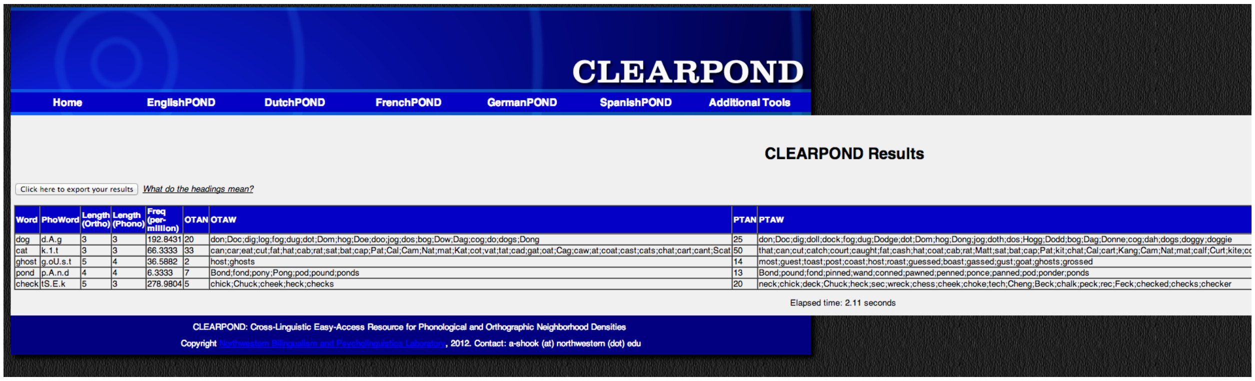
Results:

In part one of the lab I used the words: “bank”, “work”, “beige”, “algorithm”, and the non-word “kde” to look at phonotactic probabilities. The results were:



These results are the likelihood of a phoneme being in its given position (second line), the likelihood that two neighboring phonemes will appear together (third line), and the sums of the second line and the sums of the third line (fourth line). What the data shows is that for the first 2 words there is a relatively high probability (around 20%) that all the phonemes will be present in their given position and that there is around a 1% chance that each will follow the other. For the third it shows a much lower probability (~10%) that the phonemes will be in their given place and a 0.2% that all the phonemes follow each other. These low probabilities explains why it is an odd sounding word in english. For the fourth word, though the totals are high relative to the other words, there are many more phonemes that contribute to the total. The reason that this word sounds awkward can be better seen by looking at the values in the third line where values (e.g. second value, third line) can be incredibly low. In the last line, the neighboring phonemes are grammatically incorrect which is shown by the 0 values in the third line.

In part two of the lab we looked at models of phonological neighborhoods.



Word	PhoWord	Length (Ortho)	Length (Phono)	Freq (per-million)	OTAN	OTAW	PTAN	PTAW
dog	d.A.g	3	3	192.8431	20	don;Doc;dig;log;fog;dug;dot;Dom;hog;Doe;doo;jog;dos;bog;Dow;Dag;cog;do;dogs;Dong	25	don;Doc;dig;doll;dock;fog;dug;Dodge;dot;Dom;hog;Dong;jog;doth;dos;Hogg;Dodd;bog;Dag;Donne;cog;dah;dogs;doggy;doggie
cat	k.1.t	3	3	66.3333	33	can;car;eat;cut;fat;hat;cab;rat;sat;bat;cap;Pat;Cal;Cam;Nat;mat;Kat;cot;vat;tat;cad;gat;oat;Cag;caw;at;coat;cast;cats;chat;cart;cant;Scat	50	that;can;cut;catch;court;caught;fat;cash;hat;coat;cab;rat;Matt;sat;bat;cap;Pat;kit;chat;Cal;cart;Kang;Cam;Nat;mat;calf;Curt;kite;c
ghost	g.oU.s.t	5	4	36.5882	2	host;ghosts	14	most;guest;toast;post;coast;host;roast;guessed;boast;gassed;gust;goat;ghosts;grossed
pond	p.A.n.d	4	4	6.3333	7	Bond;fond;pony;Pong;pod;pound;ponds	13	Bond;pound;fond;pinned;wand;conned;pawned;penned;ponce;panned;pod;ponder;ponds
check	tS.E.k	5	3	278.9804	5	chick;Chuck;cheek;heck;checks	20	neck;chick;deck;Chuck;heck;sec;wreck;chess;cheek;choke;tech;Cheng;Beck;chalk;peck;rec;Feck;checked;checks;checker

These results show, for each input, what words are similar in terms of phonemes. It gives results based on phonological (based on sound) and orthological (based on writing) neighborhoods. It lists the number of phonemes (by each measure), the frequency per million words of similar words, and it lists words of the same length that are similar. It finds similar words by replacing a given phoneme with a phonologically similar one.

In an article found on Pubmed, a study was done to analyze the effects of errors in speech production with words in dense phonological neighborhoods. The study used tongue-twisters vs. sentences with fewer similar sounding words to measure errors in speech production. The results, as would be expected, were that the tongue twisters produced higher frequencies of misspoken words.

The influence of phonological similarity neighborhoods on speech production.
Vitevitch, Michael S.
Journal of Experimental Psychology: Learning, Memory, and Cognition, Vol 28(4), Jul 2002, 735-747. doi: 10.1037/0278-7393.28.4.735

In part three of the lab we used WordNet to look at semantic neighborhoods. As opposed to phonological neighborhoods which are based on sound, semantic neighborhoods are based on meaning. The produced chart (below) shows the dictionary definitions of all uses of the word “table” and categorizes the by their form of speech (noun, verb). When the direct hyponym tab is clicked under the second definition of “table”, words that are correlated in meaning with table are displayed. Examples of these would be “alter”, “booth”, “breakfast”, “card”, and “coffee”. When the hypernym tab is clicked the definition of furniture, the most relevant category into which “table” falls, appears.

The graph created by visuwords (below) shows “table” as a central node, with all of the hyponyms as children, and any relevant hyponyms of the children as new nodes that are children of “table’s” children.

WordNet Search - 3.1

- WordNet home page - Glossary - Help

Word to search for: table Search WordNet

Display Options: (Select option to change) Change

Key: "S:" = Show Synset (semantic) relations, "W:" = Show Word (lexical) relations

Display options for sense: (frequency) {offset} <lexical filename > [lexical file number] (gloss) "an example sentence"

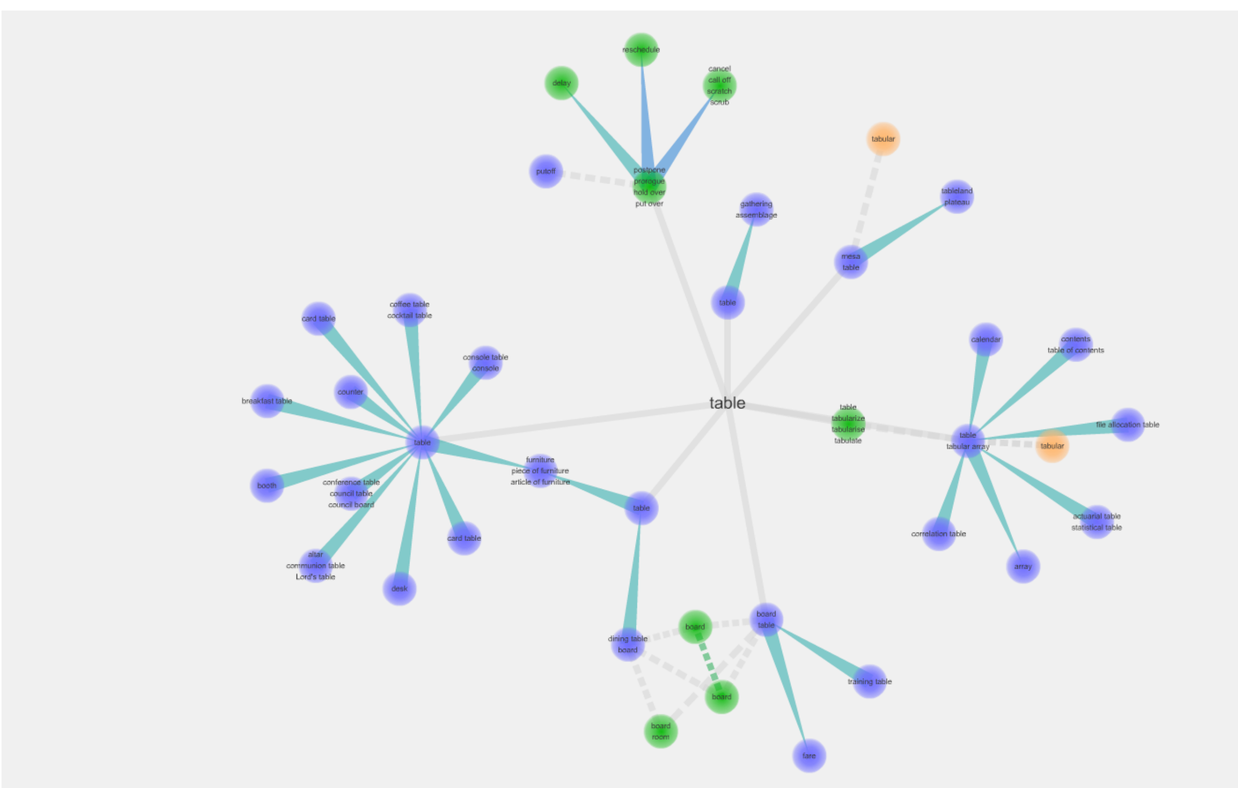
Display options for word: word#sense number (sense key)

Noun

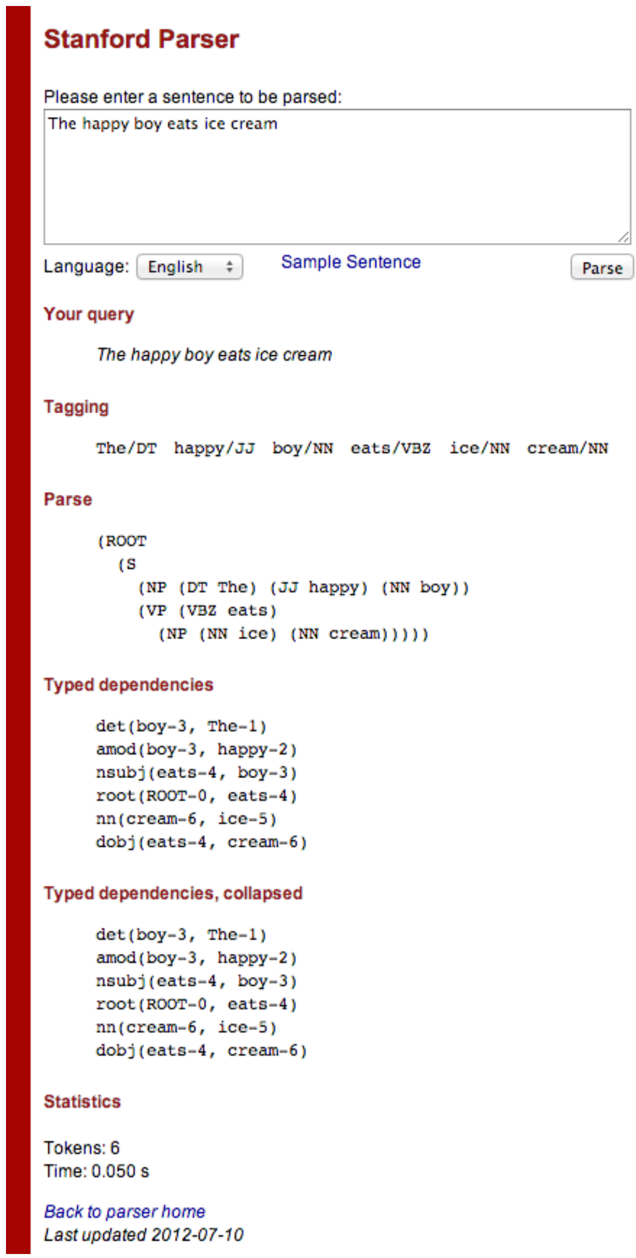
- (52){08283156} <noun.group>[14] S: (n) **table#1 (table%1:14:00::)**, tabular array#1 (tabular_array%1:14:00::) (a set of data arranged in rows and columns) *"see table 1"*
- (25){04386330} <noun.artifact>[06] S: (n) **table#2 (table%1:06:01::)** (a piece of furniture having a smooth flat top that is usually supported by one or more vertical legs) *"it was a sturdy table"*
- (5){04387051} <noun.artifact>[06] S: (n) **table#3 (table%1:06:02::)** (a piece of furniture with tableware for a meal laid out on it) *"I reserved a table at my favorite restaurant"*
- {09374802} <noun.object>[17] S: (n) mesa#1 (mesa%1:17:00::), **table#4 (table%1:17:00::)** (flat tableland with steep edges) *"the tribe was relatively safe on the mesa but they had to descend into the valley for water"*
- {08497146} <noun.group>[14] S: (n) **table#5 (table%1:14:01::)** (a company of people assembled at a table for a meal or game) *"he entertained the whole table with his witty remarks"*
- {07580824} <noun.food>[13] S: (n) board#4 (board%1:13:00::), **table#6 (table%1:13:01::)** (food or meals in general) *"she sets a fine table"; "room and board"*

Verb

- {02648898} <verb.stative>[42] S: (v) postpone#1 (postpone%2:42:00::), prorogue#1 (prorogue%2:42:00::), hold over#5 (hold_over%2:42:02::), put over#2 (put_over%2:42:00::), **table#1 (table%2:42:00::)**, shelve#1 (shelve%2:42:00::), set back#1 (set_back%2:42:01::), defer#1 (defer%2:42:00::), remit#2 (remit%2:42:00::), put off#1 (put_off%2:42:00::) (hold back to a later time) *"let's postpone the exam"*
- {01749344} <verb.creation>[36] S: (v) **table#2 (table%2:36:00::)**, tabularize#1 (tabularize%2:36:00::), tabularise#1 (tabularise%2:36:00::), tabulate#1 (tabulate%2:36:00::) (arrange or enter in tabular form)



In part four of the lab we looked at syntactic parsers of sentence structure. We used the online parser created by Stanford for this section of the lab. The sentences "The happy boy eats ice cream." and "If either the girl eats ice cream or the girl eats candy then the boy eats hot dogs." were run through the parser. For the first sentence the parse tree was the same as the lecture notes, broken down into noun and verb phrases, then broken down into parts of speech. It also creates the same tree for the second sentence with multiple sentences embedded within a larger sentence.



Stanford Parser

Please enter a sentence to be parsed:

The happy boy eats ice cream

Language: English Sample Sentence Parse

Your query

The happy boy eats ice cream

Tagging

```
The/DT  happy/JJ  boy/NN  eats/VBZ  ice/NN  cream/NN
```

Parse

```
(ROOT
  (S
    (NP (DT The) (JJ happy) (NN boy))
    (VP (VBZ eats)
      (NP (NN ice) (NN cream)))))
```

Typed dependencies

```
det(boy-3, The-1)
amod(boy-3, happy-2)
nsubj(eats-4, boy-3)
root(ROOT-0, eats-4)
nn(cream-6, ice-5)
dobj(eats-4, cream-6)
```

Typed dependencies, collapsed

```
det(boy-3, The-1)
amod(boy-3, happy-2)
nsubj(eats-4, boy-3)
root(ROOT-0, eats-4)
nn(cream-6, ice-5)
dobj(eats-4, cream-6)
```

Statistics

Tokens: 6
Time: 0.050 s

Back to parser home
Last updated 2012-07-10

Stanford Parser

Please enter a sentence to be parsed:

If either the girl eats ice cream or the girl eats candy then the boy eats hot dogs.

Language: English Sample Sentence Parse

Your query

If either the girl eats ice cream or the girl eats candy then the boy eats hot dogs.

Tagging

```
If/IN either/RB the/DT girl/NN eats/VBZ ice/NN cream/NN or/CC the/DT girl/NN eats/VBZ candy/NN then/RB the/DT boy/NN eats/VBZ hot/JJ dogs/NNS ./.
```

Parse

```
(ROOT
  (S
    (SBAR (IN If)
      (S
        (NP (RB either) (DT the) (NN girl))
        (VP (VBZ eats)
          (SBAR
            (S
              (NP
                (NP (NN ice) (NN cream))
                (CC or)
                (NP (DT the) (NN girl)))
              (VP (VBZ eats)
                (NP (NN candy))
                (ADVP (RB then))))))))
    (NP (DT the) (NN boy))
    (VP (VBZ eats)
      (NP (JJ hot) (NNS dogs)))
    (. .)))
```

For the sentence "If I go out then I will have fun or I will not but if I do not go out then I will still have fun unless everyone else does go out." the parser creates a tree with several nodes, like the previous, where each branch is made up of embedded sentences.

Stanford Parser

Please enter a sentence to be parsed:

If I go out then i will have fun or I will not but if I do not go out then i will still have fun unless everyone else does go out.

Language: English Sample Sentence Parse

Your query

If I go out then i will have fun or I will not but if I do not go out then i will still have fun unless everyone else does go out

Tagging

```
If/IN I/PRP go/VBP out/RP then/RB i/FW will/MD have/VB fun/NN or/CC I/PRP will/MD not/RB but/CC if/IN I/PRP do/VBP not/RB go/VB out/RP then/RB i/FW will/MD still/RB have/VB fun/NN unless/IN everyone/NN else/RB does/VBZ go/VB out/RP
```

Parse

```
(ROOT
  (SBAR (IN If)
    (S
      (NP (PRP I))
      (VP (VBP go)
        (PRT (RP out))
        (S
          (S
            (ADVP (RB then))
            (NP (FW i))
            (VP (MD will)
              (VP (VB have)
                (NP (NN fun)))))
          (CC or)
          (S
            (NP (PRP I))
            (VP (MD will) (RB not)))
          (CC but)
          (S
            (SBAR (IN if)
              (S
                (NP (PRP I))
                (VP (VBP do) (RB not)
                  (VP (VB go)
                    (PRT (RP out))
                    (ADVP (RB then))))))
            (NP (FW i))
            (VP (MD will)
              (ADVP (RB still))
              (VP (VB have)
                (NP (NN fun))
                (SBAR (IN unless)
                  (S
                    (NP (NN everyone) (RB else))
                    (VP (VBZ does)
                      (VP (VB go)
                        (PRT (RP out))))))))))))))
```

Conclusion:

In this lab we looked at several tools model how the brain breaks down and analyses speech. We looked at tools that allow us to model how we identify words based on phonological probabilities. Building up from there we looked at phonological neighborhoods, a model that shows how we can plan further build words from phonemes and helps explain how we make mistakes when forming words from phonemes. Similar to phonological neighborhoods, we looked at syntactic neighborhoods, which shows relationships between words based on their meaning. Lastly we looked at Syntactic parsers which shows how we create sentences and extract meaning from them.