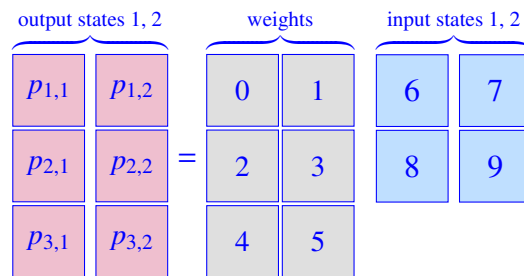


LING3804: Problem Set 3

Due via Carmen dropbox at 11:59 PM 2/23.

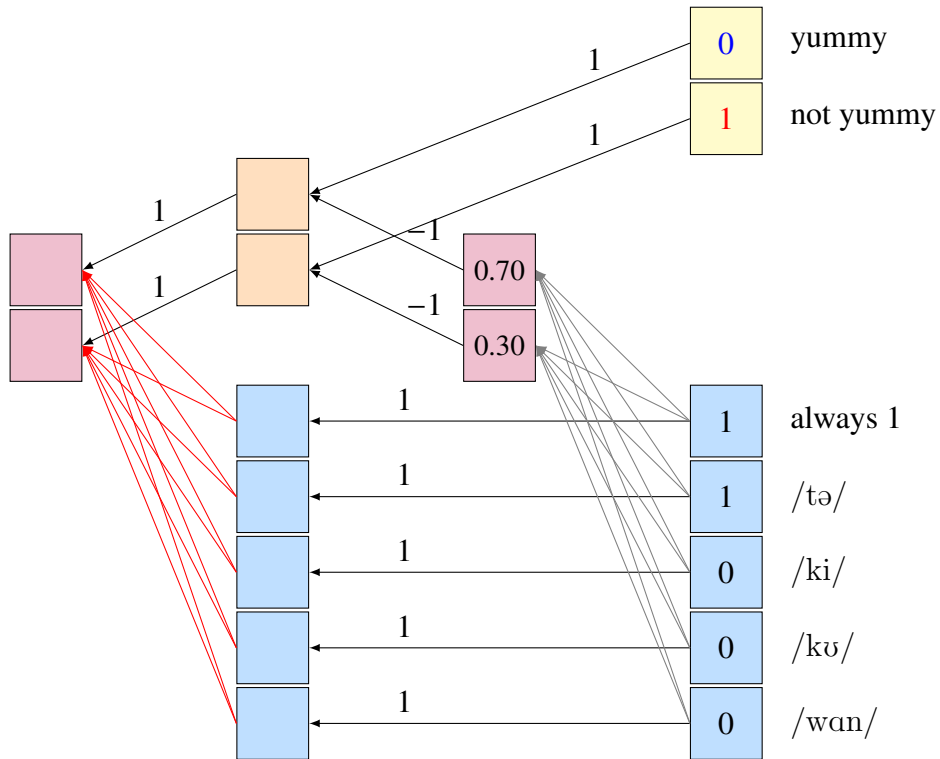
1. (a) [3 pts.] Using the grammar rules defined in the lecture notes on syntax, draw an analysis tree for the sentence *They peeled and ate the apples*, using the following categories (note that *and* is part of a grammatical rule):
 - **N** for *they*
 - **V-aN-bN** for *peeled*
 - **V-aN-bN** for *ate*
 - **D** for *the*
 - **N-aD** for *apples*
- (b) [3 pts.] Label the rules used in your analysis.

2. Write the formula for each element of the below matrix product (e.g.: $(3 \times 5) + (2 \times 4) + \dots$):



- (a) [2 pts.] $p_{1,1}$:
- (b) [2 pts.] $p_{2,1}$:
- (c) [2 pts.] $p_{3,1}$:
- (d) [2 pts.] $p_{1,2}$:
- (e) [2 pts.] $p_{2,2}$:
- (f) [2 pts.] $p_{3,2}$:

3. (a) [5 pts.] Complete the weight adjustment for the following example, where all threshold functions are linear except gray connections are softmax and red connections are cued association formation:



- (b) [5 pts.] Compute the weight adjustment for the above cued association formation (red edges):

	always 1	/tə/	/ki/	/kʊ/	/wɒn/
yummy					
not yummy					

4. [4 pts.] Write the formula for the probability, according to the below model, of /təki/ yielding a cookie, assuming a softmax activation function as in the lecture notes on neural network learning:

	always 1	/tə/	/ki/	/kʊ/	/wɒn/
yummy	-1.97	-1.57	0.71	0.43	-1.85
not yummy	1.97	1.57	-0.71	-0.43	1.85