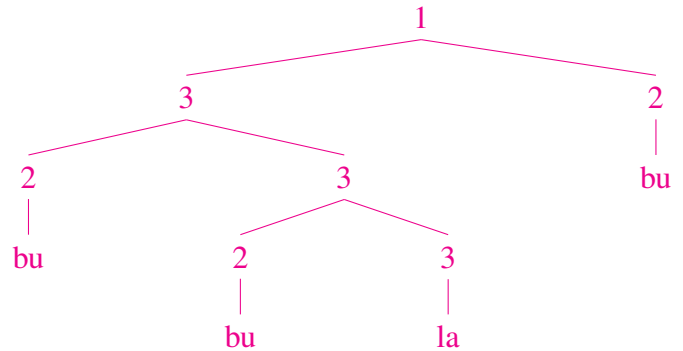
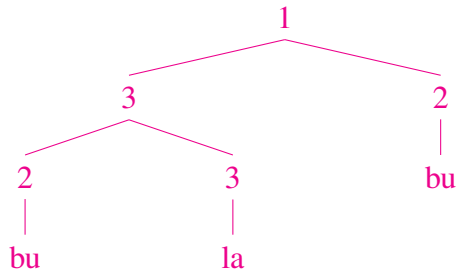


Ling 3701H / Psych 3371H: Problem Set 2

Due via Carmen dropbox at 11:59 PM 2/24.

1. [10 pts.] Suppose you think the sentences *bu la bu* and *bu bu la bu* are generated by a context-free grammar with the following derivations:



Given just these two derivations, what probabilities would you estimate for this grammar?

$$P(1 \rightarrow 2\ 3 \mid 1) =$$

$$P(1 \rightarrow 3\ 2 \mid 1) =$$

$$P(1 \rightarrow bu \mid 1) =$$

$$P(1 \rightarrow la \mid 1) =$$

$$P(2 \rightarrow 2\ 3 \mid 2) =$$

$$P(2 \rightarrow 3\ 2 \mid 2) =$$

$$P(2 \rightarrow bu \mid 2) =$$

$$P(2 \rightarrow la \mid 2) =$$

$$P(3 \rightarrow 2\ 3 \mid 3) =$$

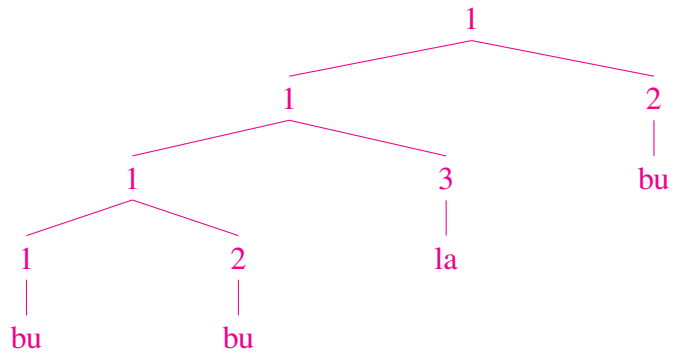
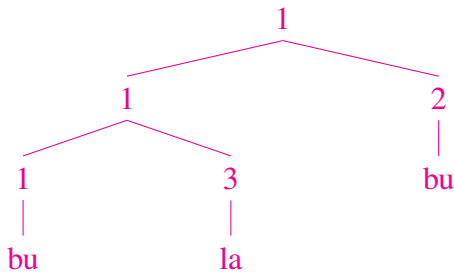
$$P(3 \rightarrow 3\ 2 \mid 3) =$$

$$P(3 \rightarrow bu \mid 3) =$$

$$P(3 \rightarrow la \mid 3) =$$

2. [10 pts.] What is the joint probability of the above two derivations given the grammar probabilities you estimated? (Show your work for partial credit.)

3. [10 pts.] Suppose you think the (same) sentences *bu la bu* and *bu bu la bu* are generated by a context-free grammar with the following derivations:



Given just these two derivations, what probabilities would you estimate for this grammar?

$$P(1 \rightarrow 1\ 3 \mid 1) =$$

$$P(1 \rightarrow 1\ 2 \mid 1) =$$

$$P(1 \rightarrow bu \mid 1) =$$

$$P(1 \rightarrow la \mid 1) =$$

$$P(2 \rightarrow 1\ 3 \mid 2) =$$

$$P(2 \rightarrow 1\ 2 \mid 2) =$$

$$P(2 \rightarrow bu \mid 2) =$$

$$P(2 \rightarrow la \mid 2) =$$

$$P(3 \rightarrow 1\ 3 \mid 3) =$$

$$P(3 \rightarrow 1\ 2 \mid 3) =$$

$$P(3 \rightarrow bu \mid 3) =$$

$$P(3 \rightarrow la \mid 3) =$$

4. (a) [5 pts.] What is the joint probability of the above two derivations given the grammar probabilities you estimated? (Show your work for partial credit.)

- (b) [5 pts.] Which of the grammars in Question 1 and Question 3 is more probable?