

Written Assignment 2 - Mike Roylance

(1)

Jill	sang	the	baby	songs
n(Jill) (1-2)				
NP -> n* (1-2)				
NP(Jill) (1-2)				
S -> NP* VP				
	v(sang) (2-3)			
	VP -> v*			
	VP -> v* NP			
	VP -> v* NP NP			
	VP(sang) (2-3)			
S -> NP VP* (1-3)				
S(Jill sang) (1-3)				
		art(the) (3-4)		
		NP -> art* n		
		NP -> art* n n		
			n(baby) (4-5)	
			NP -> n*	
		NP -> art n* (3-5)		
		NP -> art n* n (3-5)		
			NP(baby) (4-5)	
			S -> NP* VP	
		NP(the baby) (3-5)		
		S -> NP* VP		
	VP -> v NP* (2-4)			
	VP -> v NP* NP (2-4)			
	VP(sang the baby) (2-4)			
S -> NP VP* (1-4)				
S(Jill sang the baby) (1-4)				
				n(songs) (5-6)
				NP -> n*
		NP -> art n n* (3-6)		
				NP(songs) (5-6)
				S -> NP* VP
		NP(the baby songs) (3-6)		
		S -> NP* VP		
	VP -> v NP NP* (2-6)			
	VP(sang the baby songs) (2-6)			
S -> NP VP* (1-6)				
S(Jill sang the baby songs) (1-6)				

(2)

$$P(I) = 2/9 \text{ (4/18)}$$

*18 words with 4 of them being I*

$$P(\text{what}) = 1/9 \text{ (2/18)}$$

18 words with 2 of them being what

$$P(\text{meant} \mid I) = 1/2 \text{ (2/4)}$$

I meant... I said... I said... I meant -> 4 occurrences with 2 of them I meant

$$P(\text{meant} \mid \text{what} \mid I) = 1/2$$

what I said... what I meant -> 2 occurrences with 1 of them being what I meant

$$P(\text{percent} \mid \text{one hundred}) = 1 / 1$$

one hundred percent... -> 1 occurrence

$$P(I \mid \text{what}) = 1 / 1 \text{ (2 / 2)}$$

what I... what I -> 2 occurrences with 2 of them being what I

$$P(\text{An} \mid *) = 1 / 2$$

\* I... \* An -> 2 occurrences with 1 being \* An

$$P(\text{An} \mid \text{is}) = 0 / 1$$

is faithful... -> 1 occurrence with 0 of them being faithful an

(3)

$$P(I \mid \text{PRO}) = 2 / 3 \text{ (4 / 6)}$$

I... what... I... I... what... I...

$$P(\text{said} \mid \text{VB}) = 2 / 5$$

meant... said... said... meant... is...

$$P(\text{PRO} \mid *) = 1 / 2$$

I... An...

$$P(\text{VB} \mid \text{PRO}) = 2 / 3 \text{ (4 / 6)}$$

PRO-VB... PRO-PRO... PRO-VB... PRO-VB... PRO-PRO... PRO-VB

$$P(\text{NOUN} \mid \text{NUM}) = 1 / 2$$

NUM-NUM... NUM-NOUN...

$$P(\text{PRO} \mid \text{VB} \mid \text{PRO}) = 2 / 2$$

VB-PRO-PRO... VB-PRO-PRO...

$$P(\text{ART} \mid \text{NOUN VB}) = 0 / 0$$

(4)

NOUN	FREQ	UNSMOOTHED PROB	SMOOTHED FREQ	SMOOTHED PROB
apple	800	8/21 (800 / 2100)	801	801 / 2106 (801 / 2106)
banana	700	7/21 (700/2100)	701	701 / 2106 (701 / 2106)
cherry	500	5/21 (500/2100)	501	501 / 2106 (501 / 2106)
pear	70	7/210 (70/2100)	71	71 / 2106 (71 / 2106)
mango	30	1/70 (30/2100)	31	31 / 2106 (31 / 2106)
kiwi	0	0	1	1 / 2106 (1 / 2106)

(5)

### Top-down approach (parentheses means path/thread)

S -> \*NP VP  
 NP -> \*noun  
 found NLP!  
 NP -> noun\*  
 S -> NP \*VP  
 VP -> \*verb  
 VP -> \*verb ADJP  
 found is!  
 ( VP -> verb\*  
   S -> NP VP\*  
   found S! NLP is)  
 (VP -> verb \*ADJP  
   ADJP -> \*adj  
   found cool!  
   ADJP -> adj\*  
   VP -> verb ADJP\*  
   S -> NP VP\*  
   found S! NLP is cool)

### Bottom-up approach (parentheses means path/thread)

NLP found!  
 noun (NLP)  
 NP -> noun\*  
 S -> NP\* VP  
 found is!  
 (VP -> verb\*  
   S -> NP VP\*  
   S(NLP is))  
 VP -> verb\* ADJP

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found cool!  
 ADJP -> adj\*  
 VP -> verb ADJP\*  
 VP(Is Cool)  
 S -> NP VP\*  
 S(NLP is cool)

(6)

<b>S -&gt; *NP VP</b>					
<b>NP -&gt; *n</b>					
	n(jill)				
	NP -> n*				
	NP(jill)				
	S -> NP *VP				
	VP -> *v				
	VP -> *v NP				
	VP -> *v NP NP				
		v(sang)			
		VP -> v*			
		VP -> v *NP			
		VP -> v *NP NP			
		VP(sang)			
		S -> NP VP*			
		S(Jill sang)			
		NP -> *n			
		NP -> *art n			
		NP -> *art n n			
			art(the)		
			NP -> art *n		
			NP -> art *n n		
				n(baby)	
				NP -> art n*	
				NP(baby)	
			NP(the baby)		
		VP -> v NP*			
		VP(sang the baby)			
	S -> NP VP*				
	S(Jill sang the baby)				
				NP -> art n *n	
					n(songs)
					NP -> art n n*
				NP -> art n n*	
			NP -> art n n*		
			NP(the baby songs)		

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		VP -> v NP*			
		VP(sang the baby songs)			
		S -> NP VP*			
	S -> NP VP*				
	S(Jill sang the baby songs)				