Assignment 5: PCFGs

L645/B659, Sandra Kuebler

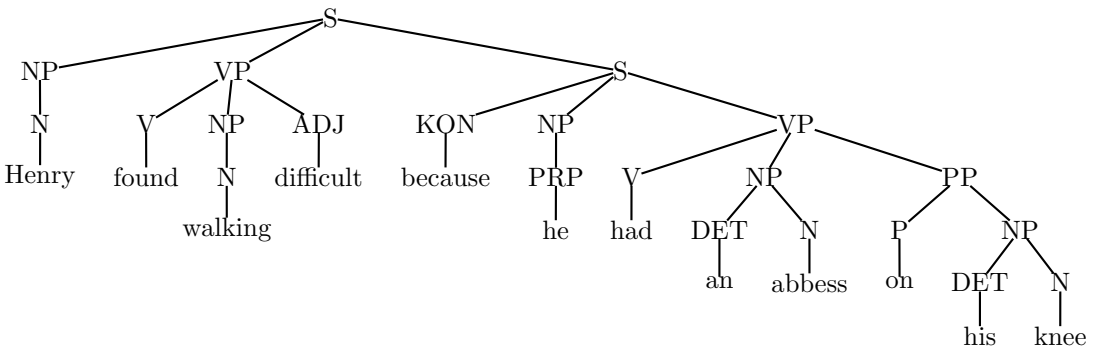
DUE: at beginning of class on Tuesday, November 18

1. Calculate the probability of the following parse and the given grammar:

   grammar:

S	→	NP VP	0.4	N	→	abbess	0.2
S	→	NP VP S	0.3	N	→	walking	0.3
S	→	KON NP VP	0.3	N	→	knee	0.4
NP	→	DET N	0.5	V	→	found	0.7
NP	→	N	0.3	V	→	had	0.3
NP	→	PRP	0.2	ADJ	→	difficult	1.0
PP	→	P NP	1.0	KON	→	because	1.0
VP	→	V	0.3	PRP	→	he	1.0
VP	→	V NP PP	0.4	DET	→	an	0.7
VP	→	V NP ADJ	0.3	DET	→	his	0.3
N	→	Henry	0.1	P	→	on	1.0

   parse:



   10 pts.

2. Calculate the chart of inside probabilities for the following grammar and sentence. If you are enrolled in B659, write a program to calculate this. Submit your code and an output and make sure that I can follow how you got to these probabilities. Otherwise, you can do the calculation manually.

   grammar:

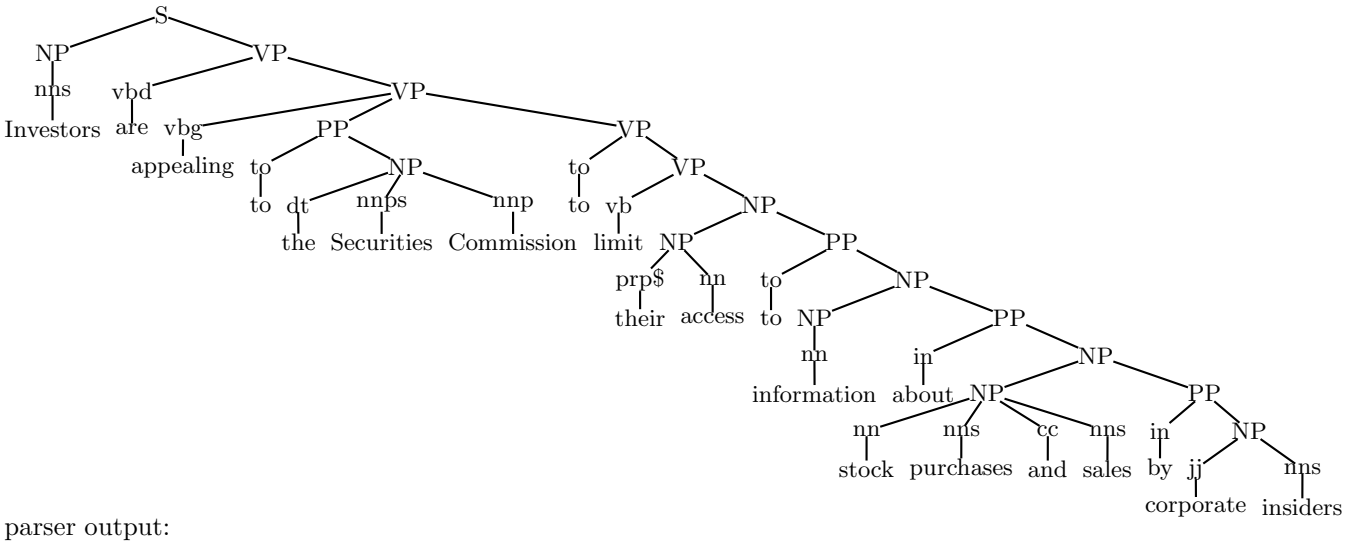
S	→	NP VP	1.0
NP	→	DET N	0.4
NP	→	N	0.3
NP	→	NP PP	0.3
VP	→	V NP	0.8
VP	→	V XP	0.2
PP	→	IN NP	1.0
XP	→	NP PP	1.0
DET	→	*a*	1.0
N	→	*dog*	0.1
N	→	*pizza*	0.2
N	→	*fork*	0.4
N	→	*kitchen*	0.3
V	→	*ate*	1.0
IN	→	*with*	0.4
IN	→	*in*	0.6

sentence: *A dog ate pizza with a fork in a kitchen.*

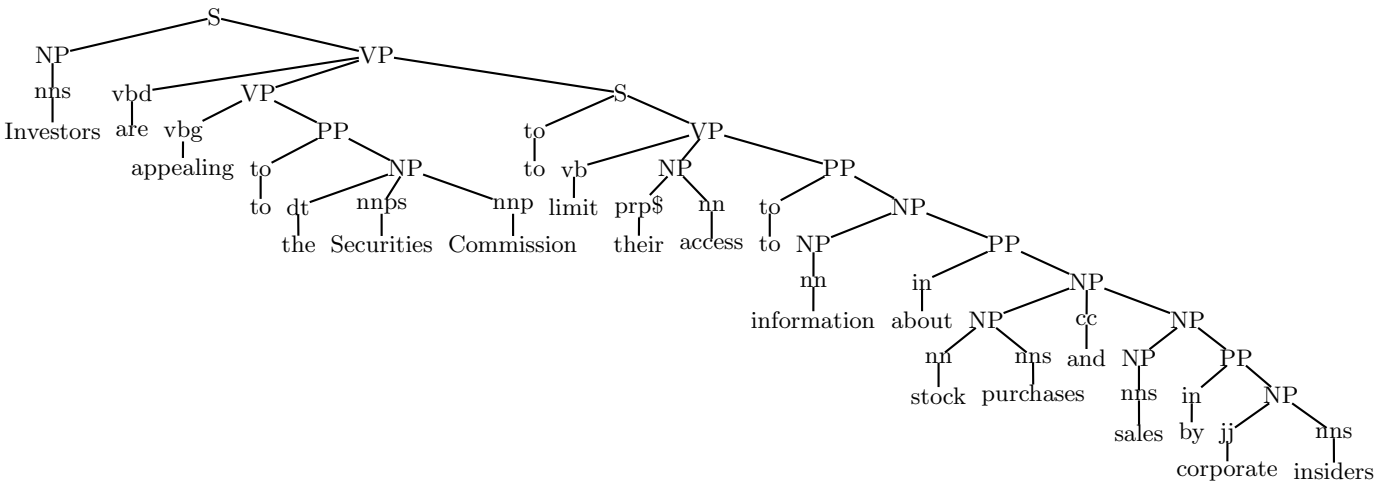
20 pts.

3. Calculate the following evaluation measures for the parse trees below: precision, recall, labeled precision, and labeled recall. (POS tags should be ignored, they are written in lower case.) Explain!

gold standard:



parser output:



10 pts.