

Introduction to Syntax and Parsing  
ACS 2015/16  
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L1: Automatic Linguistic Annotation



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# Automatic Linguistic Annotation

England's fencers won gold on day 4 in Delhi with a medal-winning performance. This is Dr. Black's second gold of the Games.

# Sentence Segmentation

England's fencers won gold on day 4 in Delhi with a medal-winning performance.

This is Dr. Black's second gold of the Games.

# Tokenisation (What's a Word?)

England 's fencers won gold on day 4 in Delhi with a medal- winning performance .

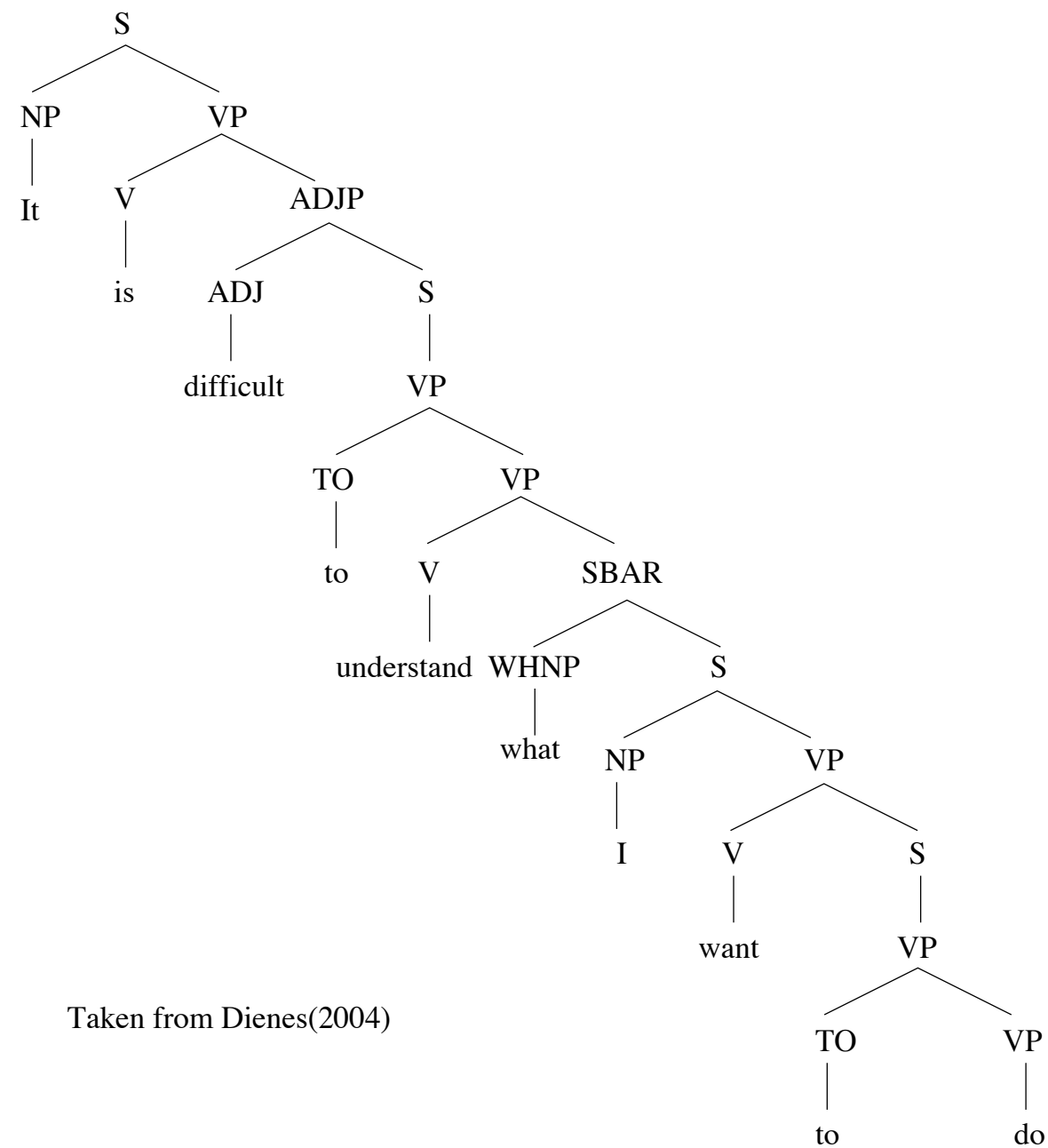
This is Dr. Black 's second gold of the Games .

# Part-of-Speech Tagging

England|NNP 's|POS fencers|NNS won|VBD gold|NN on|  
IN day|NN 4|CD in|IN Delhi|NNP with|IN a|DT medal-|JJ  
winning|JJ performance|NN .|.

This|DT is|VBZ Dr.|NNP Black|NNP 's|POS second|JJ  
gold|NN of|IN the|DT Games|NNP .|.

# Syntactic Parsing - Phrase Structure



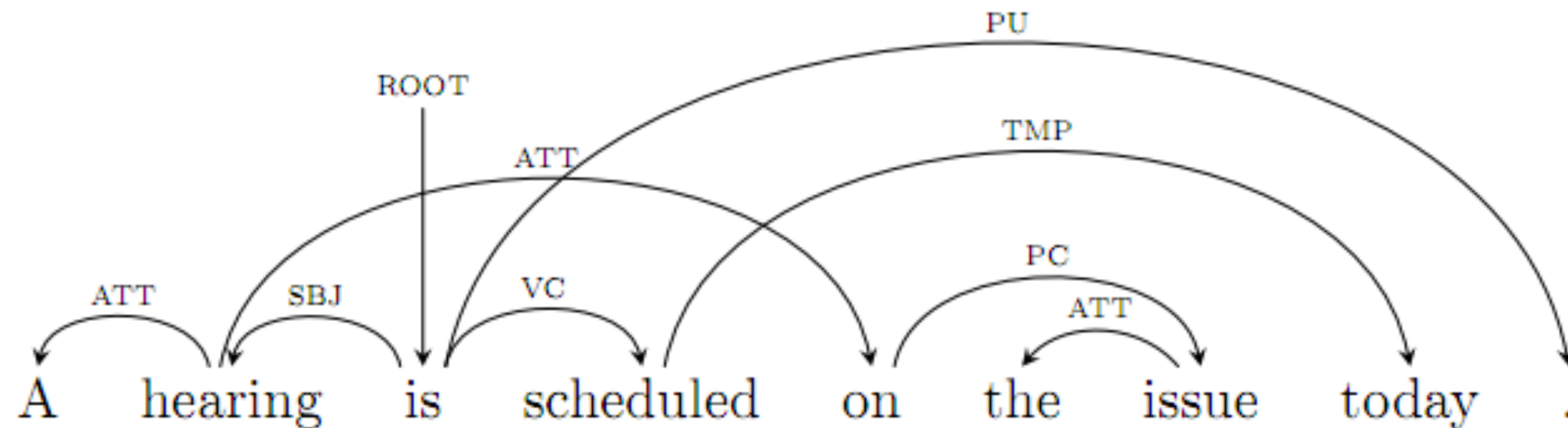
Taken from Dienes(2004)

# Semantic Parsing - Logical Form

From 1953 to 1955 , 9.8 billion Kent cigarettes with the filters were sold , the company said .

x1	x2 x3			
<hr/>				
( company(x1) single(x1)	A	say(x2) agent(x2,x1) theme(x2,x3) proposition(x3)		
<hr/>				
	x3:	x4	x5	x6 x7 x8
		<hr/>		
	(	card(x4)=billion 9.8(x4) kent(x4) cigarette(x4) plural(x4)	;( filter(x5) plural(x5)	A with(x4,x5) sell(x6) patient(x6,x4) 1953(x7) single(x7) 1955(x8) single(x8) to(x7,x8) from(x6,x7) event(x6)
				)
		<hr/>		
		event(x2)		

# Syntactic Parsing - Dependency Structure

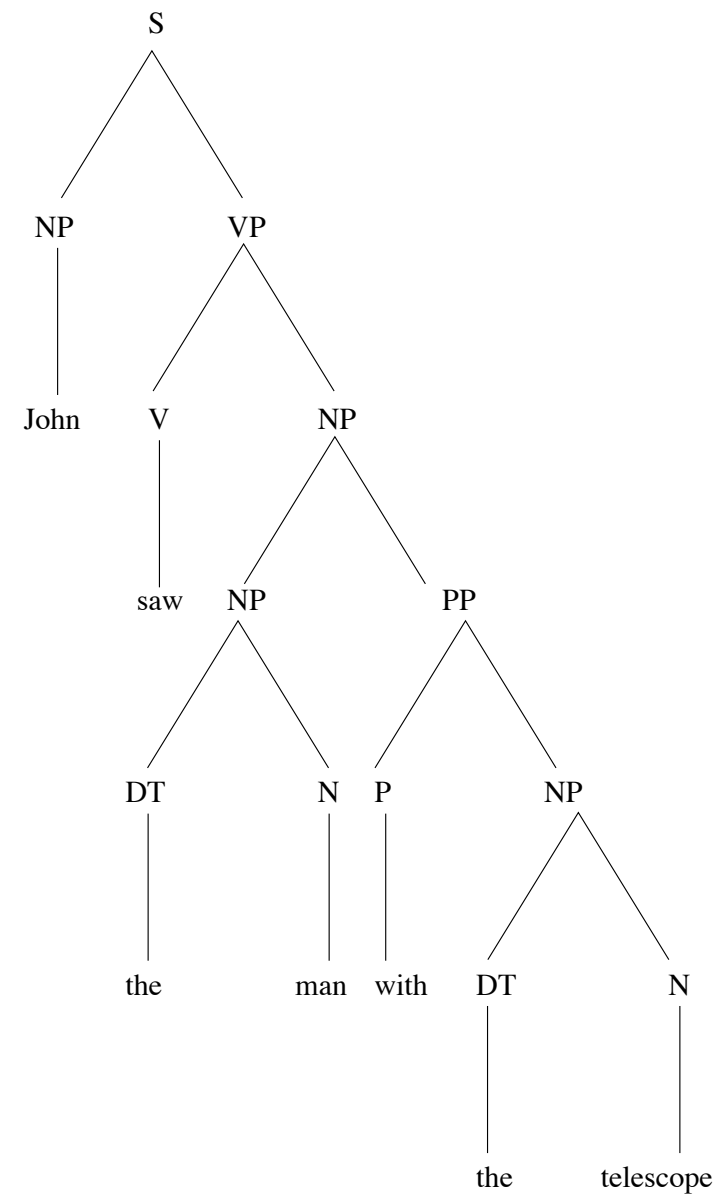
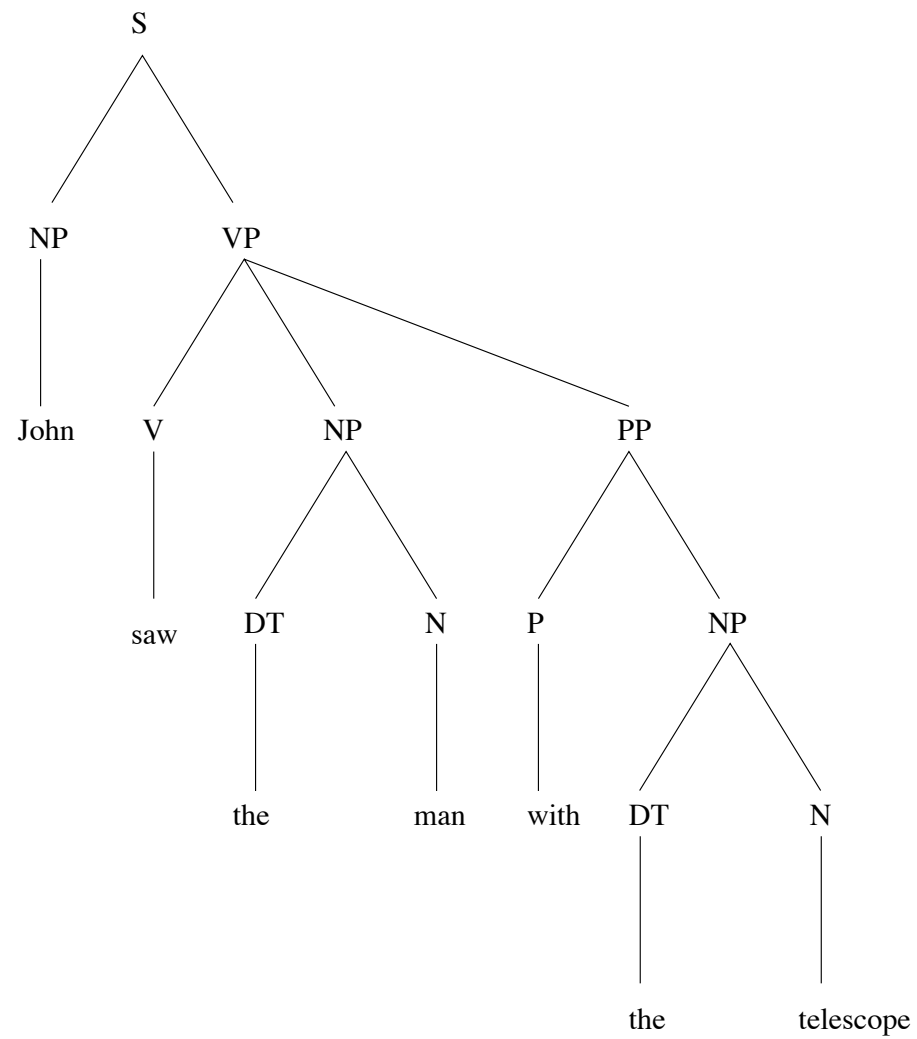




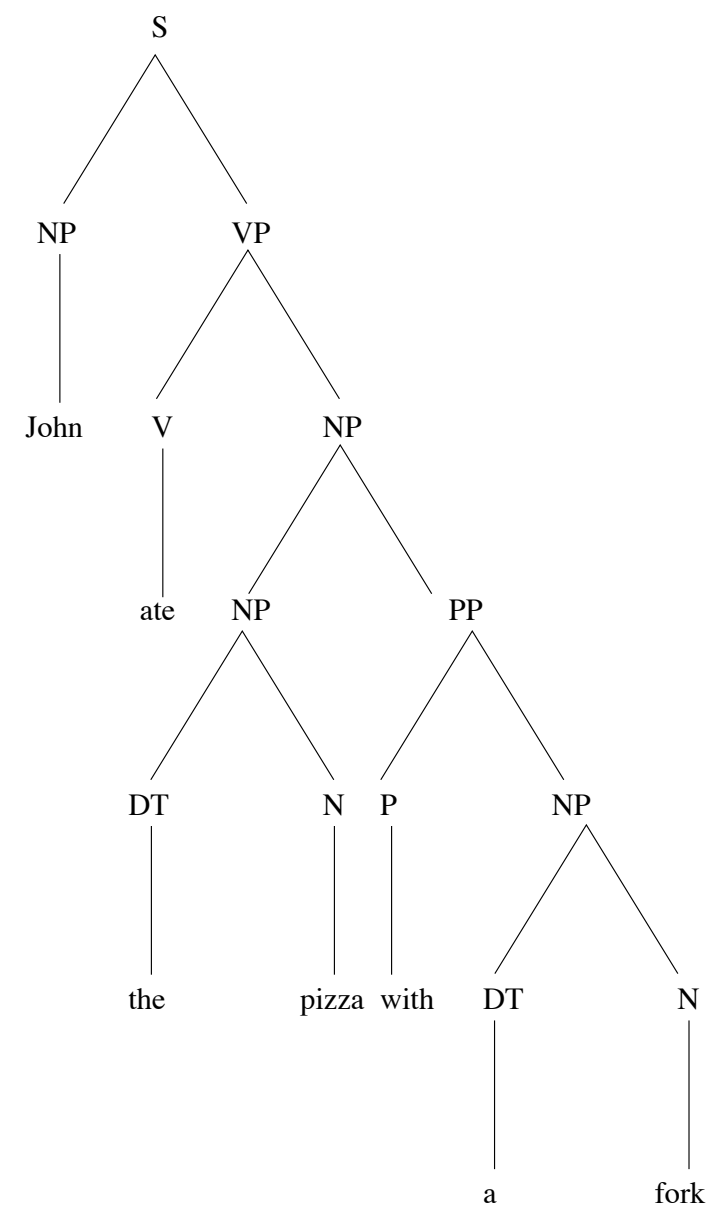
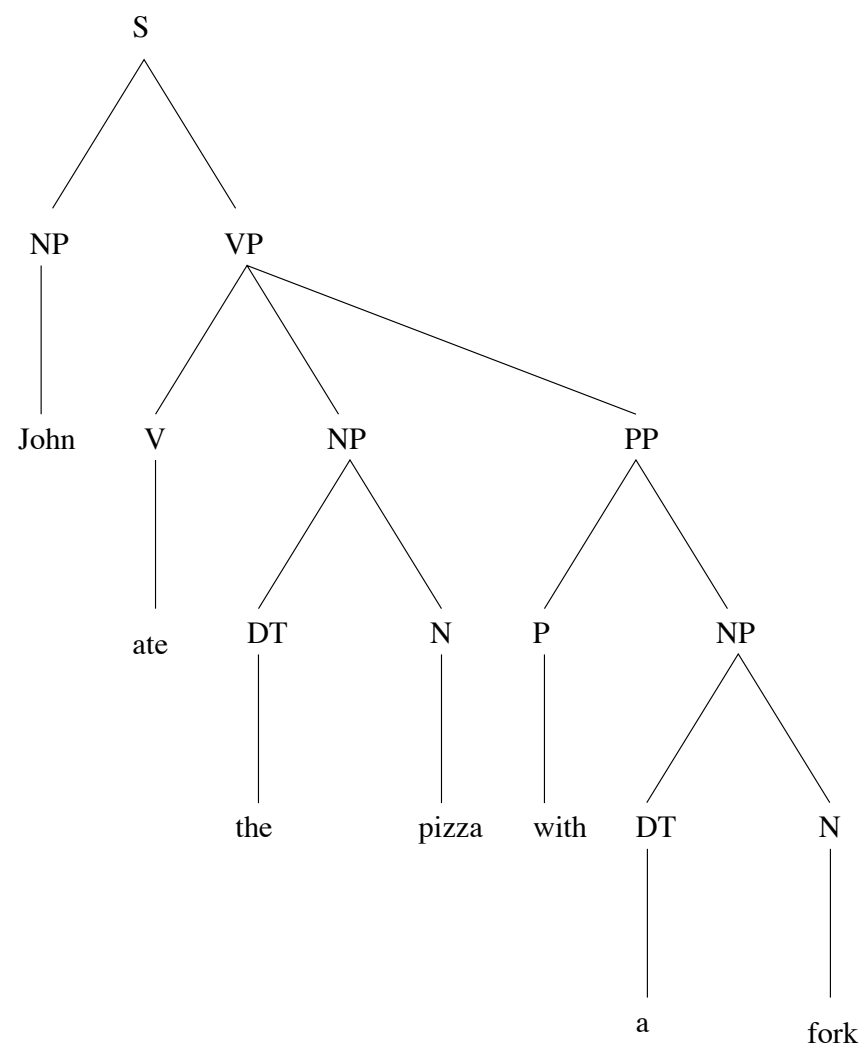
# Why is Parsing Difficult?

- Obtaining a wide-coverage grammar which can handle arbitrary real text is challenging
- Natural language is surprisingly **AMBIGUOUS**

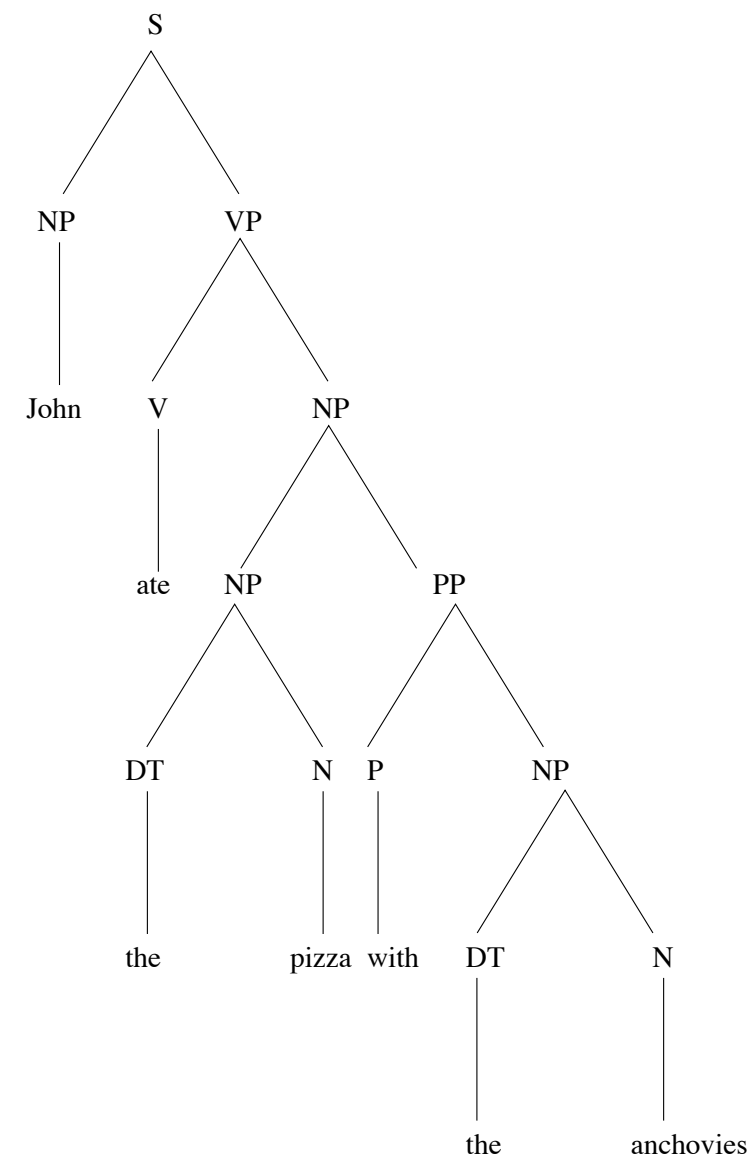
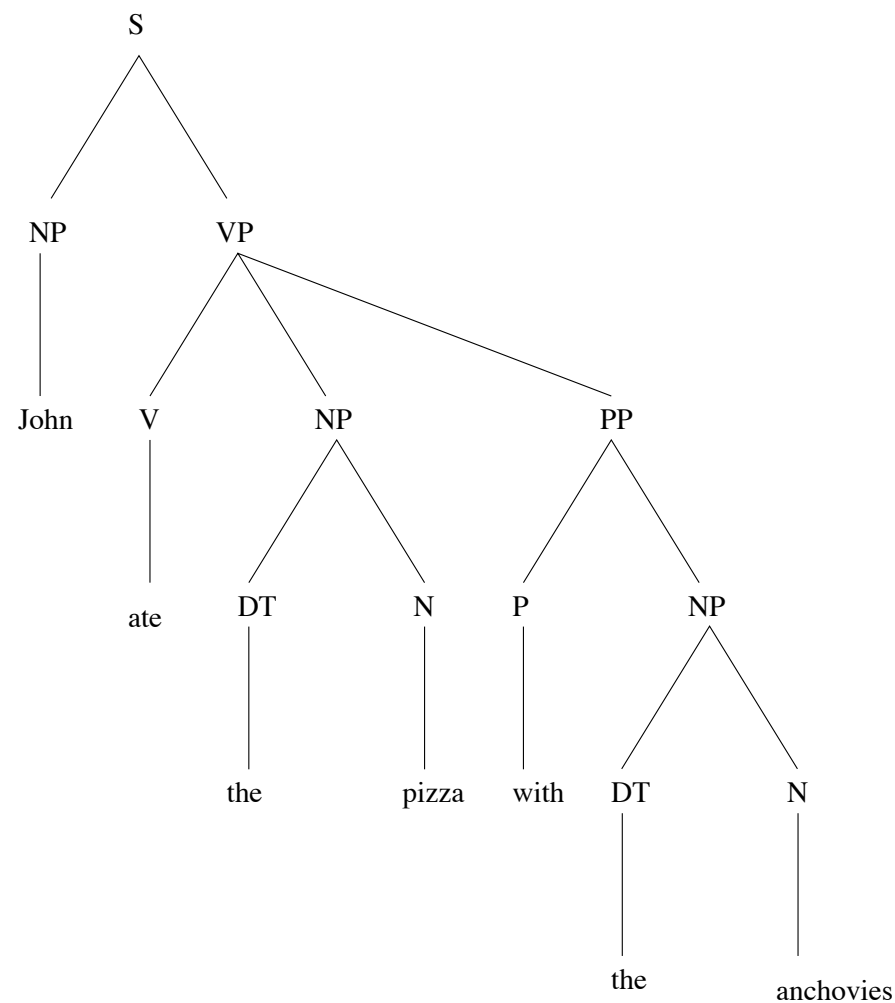
# Syntactic Ambiguity



# Syntactic Ambiguity: the problem is worse than you think



# Syntactic Ambiguity: the problem is worse than you think



# Syntactic Ambiguity: the problem is even worse than that

- Put the block in the box on the table **2 analyses**
- Put the block in the box on the table beside the chair **5 analyses**
- Put the block in the box on the table beside the chair before the table **14 analyses**
- Put the block in the box on the table beside the chair before the table in the kitchen **42 analyses**
- ... **132 analyses**
- ... **469 analyses**
- ... **1430 analyses**
- ... **4862 analyses**

# Interesting Ambiguity Examples

- The a are of I
- The cows are grazing in the meadow
- John saw Mary

examples from Abney (1996)