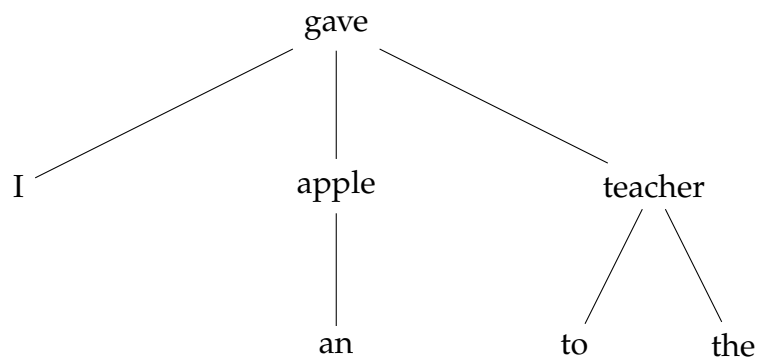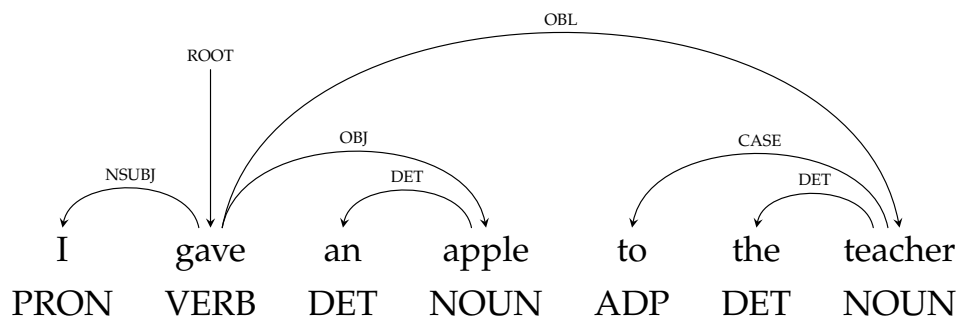# NLP Assignment 2: Dependency Relations & Transition-based Parser

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1 Introduction

Dependency tree of "I gave an apple to the teacher".

Step	Stack	Buffer	Action	Output
0	[__ROOT__]	[I, gave, an, apple, to, the, teacher]	SHIFT	
1	[__ROOT__, I]	[gave, an, apple, to, the, teacher]	SHIFT	
2	[__ROOT__, I, gave]	[an, apple, to, the, teacher]	LEFT	(I → gave)
3	[__ROOT__, gave]	[an, apple, to, the, teacher]	SHIFT	
4	[__ROOT__, gave, an]	[apple, to, the, teacher]	SHIFT	
5	[__ROOT__, gave, an, apple]	[to, the, teacher]	LEFT	(an ← apple)
6	[__ROOT__, gave, apple]	[to, the, teacher]	RIGHT	(gave → apple)
7	[__ROOT__, gave]	[to, the, teacher]	SHIFT	
8	[__ROOT__, gave, to]	[the, teacher]	SHIFT	
9	[__ROOT__, gave, to, the]	[teacher]	SHIFT	
10	[__ROOT__, gave, to, the, teacher]	[]	LEFT	(the ← teacher)
11	[__ROOT__, gave, to, teacher]	[]	LEFT	(to ← teacher)
12	[__ROOT__, gave, teacher]	[]	RIGHT	(gave → teacher)
13	[__ROOT__, gave]	[]	RIGHT	(__ROOT__ → gave)
14	[__ROOT__]	[]	DONE	

Table 1: Execution trace for *I gave an apple to the teacher*.

Step	Stack	Buffer	Action	Output
0	[__ROOT__]	[Mary, missed, her, train, to, work]	SHIFT	
1	[__ROOT__, Mary]	[missed, her, train, to, work]	SHIFT	
2	[__ROOT__, Mary, missed]	[her, train, to, work]	LEFT	(Mary ← missed)
3	[__ROOT__, missed]	[her, train, to, work]	SHIFT	
4	[__ROOT__, missed, her]	[train, to, work]	SHIFT	
5	[__ROOT__, missed, her, train]	[to, work]	LEFT	(her ← train)
6	[__ROOT__, missed, train]	[to, work]	RIGHT	(missed → train)
7	[__ROOT__, missed]	[to, work]	SHIFT	
8	[__ROOT__, missed, to]	[work]	SHIFT	
9	[__ROOT__, missed, to, work]	[]	LEFT	(to ← work)
10	[__ROOT__, missed, work]	[]	RIGHT	(missed → work)
11	[__ROOT__, missed]	[]	RIGHT	(__ROOT__ → missed)
12	[__ROOT__]	[]	DONE	

Table 2: Execution trace for *Mary missed her train to work.*

Step	Stack	Buffer	Action	Output
0	[__ROOT__]	[John, gave, the, teacher, a, very, heavy, book]	SHIFT	
1	[__ROOT__, John]	[gave, the, teacher, a, very, heavy, book]	SHIFT	
2	[__ROOT__, John, gave]	[the, teacher, a, very, heavy, book]	LEFT	(John ← gave)
3	[__ROOT__, gave]	[the, teacher, a, very, heavy, book]	SHIFT	
4	[__ROOT__, gave, the]	[teacher, a, very, heavy, book]	SHIFT	
5	[__ROOT__, gave, the, teacher]	[a, very, heavy, book]	LEFT	(the ← teacher)
6	[__ROOT__, gave, teacher]	[a, very, heavy, book]	RIGHT	(gave → teacher)
7	[__ROOT__, gave]	[a, very, heavy, book]	SHIFT	
8	[__ROOT__, gave, a]	[very, heavy, book]	SHIFT	
9	[__ROOT__, gave, a, very]	[heavy, book]	SHIFT	
10	[__ROOT__, gave, a, very, heavy]	[book]	LEFT	(very ← heavy)
11	[__ROOT__, gave, a, heavy]	[book]	SHIFT	
12	[__ROOT__, gave, a, heavy, book]	[]	LEFT	(heavy ← book)
13	[__ROOT__, gave, a, book]	[]	LEFT	(a ← book)
14	[__ROOT__, gave, book]	[]	RIGHT	(gave → book)
15	[__ROOT__, gave]	[]	RIGHT	(__ROOT__ → gave)
16	[__ROOT__]	[]	DONE	

Table 3: Execution trace for *John gave the teacher a very heavy book.*

Step	Stack	Buffer	Action	Output
0	[__ROOT__]	[The, sun, shines]	SHIFT	
1	[__ROOT__, The]	[sun, shines]	SHIFT	
2	[__ROOT__, The, sun]	[shines]	LEFT	(The ← sun)
3	[__ROOT__, sun]	[shines]	SHIFT	
4	[__ROOT__, sun, shines]	[]	LEFT	(sun ← shines)
5	[__ROOT__, shines]	[]	RIGHT	(__ROOT__ → shines)
6	[__ROOT__]	[]	DONE	

Table 4: Execution trace for *The sun shines.*

References