NLP, Assignment 2

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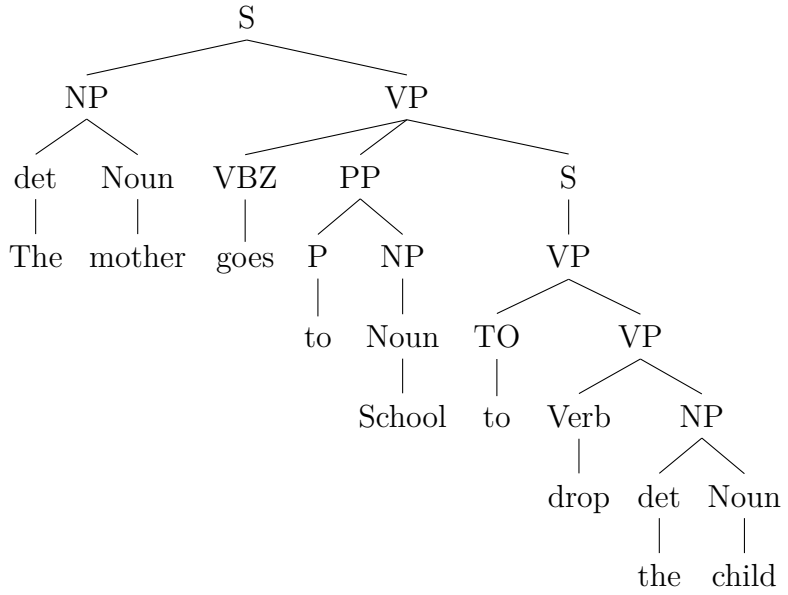
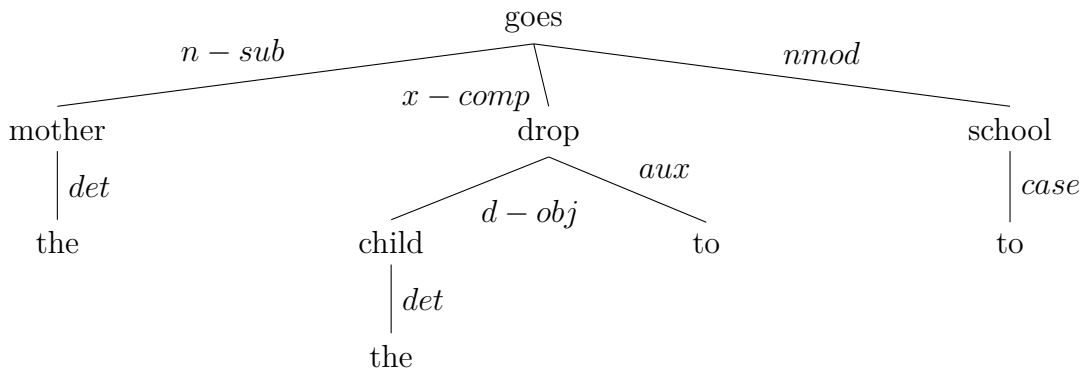
1 Sentences

1. The mother goes to school to drop the child.
2. The mother goes to school for dropping the child.
3. The mother goes to school having dropped the child.

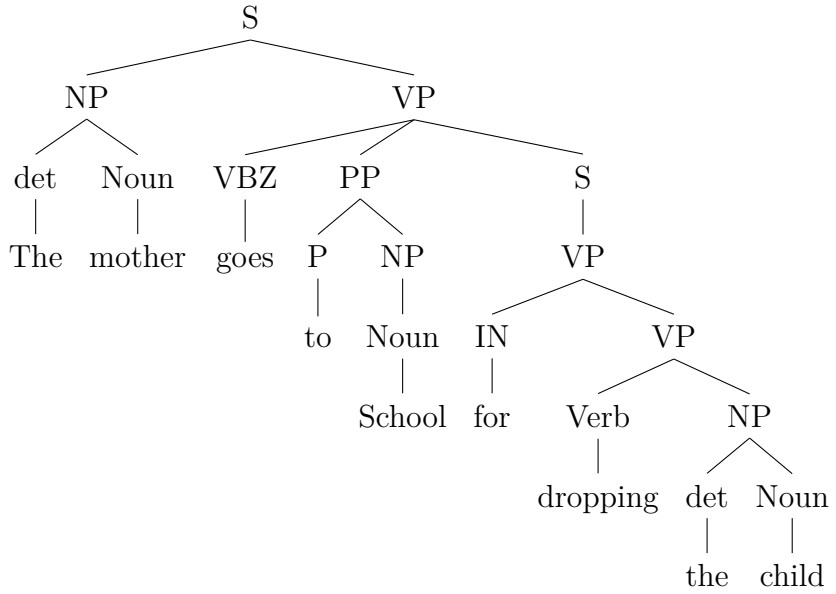
2 Phase Structure and Dependency Tree for each sentence

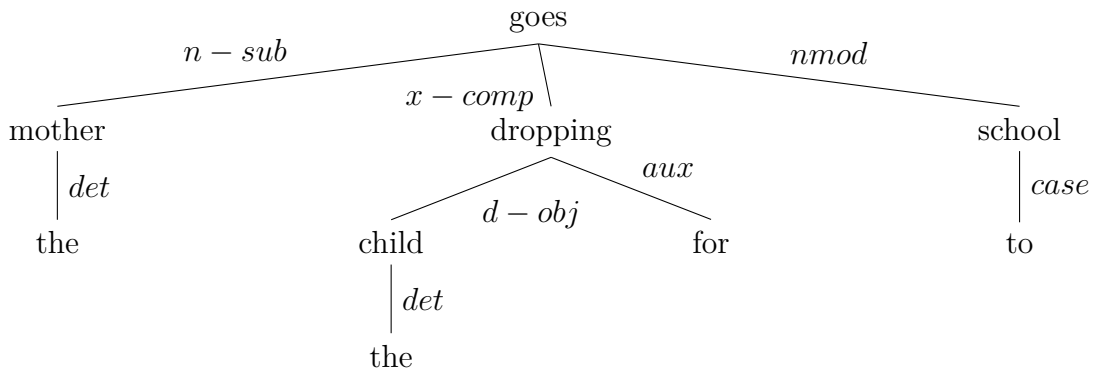
1. The mother goes to school to drop the child.



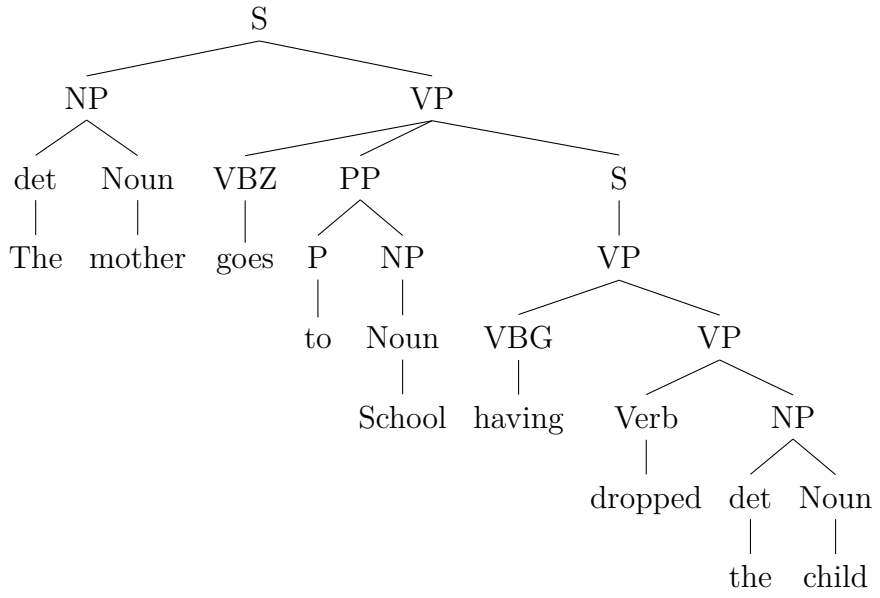


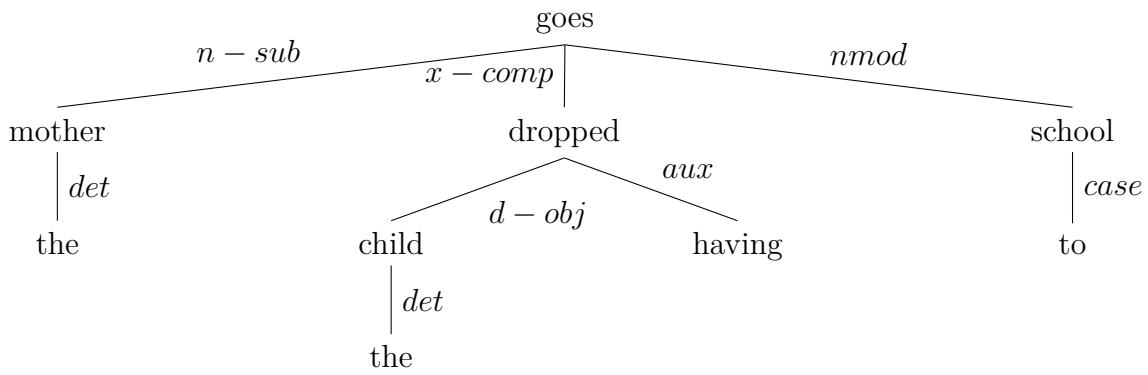
2. The mother goes to school for dropping the child.





3. The mother goes to school having dropped the child.





3 Context Free Grammar rules to cover these

1. S –> NP VP
2. NP –> det Noun
3. VP –> Verb NP
4. VP –> TO VP
5. VP –> VBZ PP S
6. VP –> VBG VP
7. VP –> IN VP
8. PP –> P NP
9. NP –> Noun
10. S' –> VP

4 Feature Specifications covering different Tense-Aspects of the verb drop

Drop occurs in the different tense-aspects:
drop, *dropped*, and *dropping*

$$\text{DROP} = \begin{bmatrix} \text{ROOT:} & \textbf{drop} \\ \text{ATTR:} & \begin{bmatrix} \text{TENSE:} & \textit{present} \\ \text{CASE:} & \textit{to} \\ \text{ASPECT:} & \textit{simple} \end{bmatrix} \end{bmatrix}$$

$$\text{DROPPED} = \begin{bmatrix} \text{ROOT:} & \textbf{drop} \\ \text{ATTR:} & \begin{bmatrix} \text{TENSE:} & \textit{past} \\ \text{CASE:} & \textit{to} \\ \text{ASPECT:} & \textit{perfect} \end{bmatrix} \end{bmatrix}$$

$$\text{DROPPING} = \begin{bmatrix} \text{ROOT:} & \textbf{drop} \\ \text{ATTR:} & \begin{bmatrix} \text{TENSE:} & \textit{continous} \\ \text{CASE:} & \textit{for} \\ \text{ASPECT:} & \textit{progressive} \end{bmatrix} \end{bmatrix}$$

This helps us deal with the number of rules we have, somewhat.
((VP –> TO VP)), ((VP –> IN VP)), ((VP –> VBG VP)) get reduced.

$$\text{VP} -> \begin{bmatrix} \text{ROOT} \\ \text{CASE} \\ \text{ASPECT} \end{bmatrix}$$

We unify the rules, as the general rule explains all the various ones and we can apply the correct one by looking up the feature specification table.

5 Handling agreement between mother and go using feature specifications

$$\text{MOTHER} = \begin{bmatrix} \text{ROOT:} & \textbf{mother} \\ \text{ATTR:} & \begin{bmatrix} \text{GENDER:} & \textit{female} \\ \text{NUMBER:} & \textit{singular} \end{bmatrix} \end{bmatrix}$$

$$\text{GO} = \begin{bmatrix} \text{ROOT:} & \textbf{go} \\ \text{ATTR:} & \begin{bmatrix} \text{TENSE:} & \textit{present} \\ \text{ASPECT:} & \textit{simple} \end{bmatrix} \end{bmatrix}$$

Comparing against the forms used:

$$\text{THE MOTHER} = \begin{bmatrix} \text{SPECIFIER:} & \textbf{definite} \\ \text{ROOT:} & \textbf{mother} \\ \text{ATTR:} & \begin{bmatrix} \text{GENDER:} & \textit{female} \\ \text{NUMBER:} & \textit{singular} \end{bmatrix} \end{bmatrix}$$

$$\text{GOES} = \begin{bmatrix} \text{ROOT:} & \textbf{go} \\ \text{ATTR:} & \begin{bmatrix} \text{TENSE:} & \textit{present} \\ \text{ASPECT:} & \textit{simple} \end{bmatrix} \end{bmatrix}$$

As we see, the forms used ('the mother' and 'goes') inherit most of their features from the general FS for 'mother' and 'go'. They also agree in attributes.
Observe the phrase "the mother goes"

$$\text{MOTHER} = \begin{bmatrix} \text{GENDER:} & \textit{female} \\ \text{NUMBER:} & \textit{singular} \\ \text{ROOT:} & \textit{mother} \end{bmatrix}$$

$$\text{THE MOTHER} = \begin{bmatrix} \text{GENDER:} & \textit{female} \\ \text{NUMBER:} & \textit{singular} \\ \text{ROOT:} & \textit{mother} \\ \text{SPECIFIER:} & \textit{definite} \end{bmatrix}$$

$$\text{THE MOTHER GOES} = \begin{bmatrix} \text{GENDER:} & \textit{female} \\ \text{NUMBER:} & \textit{singular} \\ \text{ROOT:} & \textit{mother} \\ \text{TENSE:} & \textit{present} \\ \text{ASPECT:} & \textit{singular} \\ \text{ROOT:} & \textit{go} \end{bmatrix}$$