Week 9 Tutorial Session

1. Consider the following context-free grammar G:

$$S \to \texttt{(}S\texttt{)} \mid \texttt{()}$$

It generates expressions like `()`, `(())`, `((()))`, and so on.

(a) Every partially completed rule of the form $A \to \alpha \bullet \beta$ is known as an *item*. Write all items in the grammar G and construct an NFA for all valid item updates.

(b) Convert the NFA to a DFA. Which of the states are shift states and which are reduce states? Are there any conflicts?

(c) Using the DFA, show an execution of the LR(0) parsing algorithm on the input

`((()))`

Show the stack of states, stack of processed input, and remaining input throughout the execution.

(d) Now consider the following extended context-free grammar G':

$$S \to \texttt{(}S\texttt{)} \mid \texttt{(}S\texttt{)}\,S \mid \texttt{()}$$

Show that G' is not an LR(0) grammar.