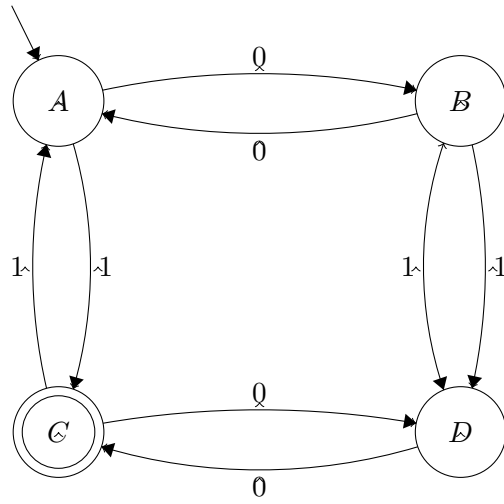


Homework 3

March 6, 2024

1: Regular Grammars



2: Context Is Everything (Except for CFGs)

(a)

$$\begin{aligned} S &\rightarrow T \mid bSaaa \\ T &\rightarrow \epsilon \mid aTaa \end{aligned}$$

(b)

$$\begin{aligned} S &\rightarrow A00B \\ B &\rightarrow \epsilon \mid 0B \\ A &\rightarrow \epsilon \mid 110A \mid 01A \end{aligned}$$

(c)

$$S \rightarrow \epsilon \mid 01 \mid 10 \mid 0011 \mid 0101 \mid 0110 \mid 1001 \mid 1010 \mid 1100$$

3: Noam, Is This Normal?

$$\begin{aligned} S &\rightarrow 0XY \mid Y \\ X &\rightarrow 1X \mid Y \\ Y &\rightarrow S \mid 0 \mid \epsilon \end{aligned}$$

START:

$$\begin{aligned} S_1 &\rightarrow S \\ S &\rightarrow 0XY \mid Y \\ X &\rightarrow 1X \mid Y \\ Y &\rightarrow S \mid 0 \mid \epsilon \end{aligned}$$

BIN:

$$\begin{aligned} S_1 &\rightarrow S \\ S &\rightarrow 0T \mid Y \\ X &\rightarrow 1X \mid Y \\ Y &\rightarrow S \mid 0 \mid \epsilon \\ T &\rightarrow XY \end{aligned}$$

DEL:

$$\begin{aligned} S_1 &\rightarrow S \mid \epsilon \\ S &\rightarrow 0T \mid Y \mid 0 \\ X &\rightarrow 1X \mid Y \mid 1 \\ Y &\rightarrow S \mid 0 \\ T &\rightarrow XY \mid X \mid Y \end{aligned}$$

UNIT:

$$\begin{aligned} S_1 &\rightarrow 0T \mid 0 \mid \epsilon \\ S &\rightarrow 0T \mid 0 \\ X &\rightarrow 1X \mid 1 \mid 0 \mid 0T \\ Y &\rightarrow 0 \mid 0T \\ T &\rightarrow XY \mid 1X \mid 1 \mid 0 \mid 0T \end{aligned}$$

TERM:

$$S_1 \rightarrow BT \mid B \mid \epsilon$$

$$S \rightarrow BT \mid B$$

$$X \rightarrow AX \mid A \mid B \mid BT$$

$$Y \rightarrow B \mid BT$$

$$T \rightarrow XY \mid AX \mid A \mid B \mid BT$$

$$A \rightarrow 1$$

$$B \rightarrow 0$$