## CSCI 341 Workshop 5

Stack Automata

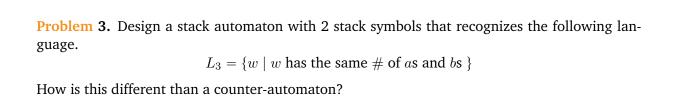
October 7, 2025

**Problem 1.** Design a stack automaton that recognizes the following language.

$$L_1 = \{a^n b^m a^n \mid n, m \in \mathcal{L}\}$$

**Problem 2.** Design a stack automaton that recognizes the following language.

$$L_2 = \{ a^{2n-1}b^{3n+1} \mid n \in \mathcal{L} \}$$



**Problem 4.** Design a stack automaton that recognizes the following language.

$$L_4 = \{ w \mid ww^{\mathsf{op}} \}$$

These are the *even-length palindromes*.

**Problem 5.** Design a stack automaton that recognizes the language of *pre-fix arithmetic expressions* for the alphabet  $A = \{ \text{ADD}, \text{SUB}, \text{DIV}, \text{MUL} \} \cup \mathbb{N}$ . These are derived from the variable P in the grammar

$$P \to N \mid \text{ADD} \; P \; P \mid \text{SUB} \; P \; P \mid \text{DIV} \; P \; P \mid \text{MUL} \; P \; P \mid N \to 0 \mid 1 \mid 2 \mid 3 \mid \dots$$

Note the spaces (these are not letters, they're just there for clarity). Now draw a parse tree that yields the following word:

ADD DIV 
$$9\ 31\ \mathrm{MUL}\ 2\ 5$$

Use the parse tree to find its value.