

COMP4141 Tute 3

PDA's, Pumping Context Free Languages, Chomsky Hierarchy

Exercise 1 Construct Push-Down Automata accepting the following languages:

- $\{w\#x \in \{0,1\}^*\# \{0,1\}^* \mid x = u w^R v \text{ for some strings } u, v \in \{0,1\}^*\}$
- All strings over alphabet $\{a,b\}$ that contain more a 's than b 's (e.g *abaaba*)

In each case, show both the transition diagram for the automaton, and explain how it works.

Exercise 2 Show that the following language is not context free:

$$\{t_1\#t_2\#\dots\#t_n \mid n \geq 2, \text{ each } t_i \in \{0,1\}^*, \text{ and } t_i = t_j \text{ for some } i \neq j \}$$

Exercise 3 Show that the language $\{ ww \mid w \in \{0,1\}^* \}$ can be generated by a context-sensitive grammar.