CSCI 301 - Lecture 28: Parsing I

P → Stmt ; Stmts

Stmt → if Cond {

$\Sigma = \{0, 1, \ldots 9, +, -, *, /, (,)\}$

$E \to E + E$
$\quad | \; E - E$
$\quad | \; E * E$
$\quad | \; E / E$
$\quad | \; (E)$
$\quad | \; 0 | 1 | 2 | \ldots | 9$

w = 1 + 1 * 4

① $E \Rightarrow E+E$
$\Rightarrow E+E*E$
$\Rightarrow 1+E*E$
$\Rightarrow 1+1*E$
$\Rightarrow 1+1*4$

② $E \Rightarrow E+E$
$\Rightarrow 1+E$
$\Rightarrow 1+E*E$
$\Rightarrow 1+1*E$
$\Rightarrow 1+1*4$

left-most derivation

~~1 + - 2~~

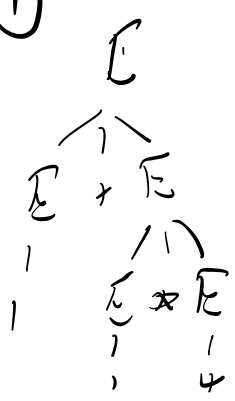
1 + 2

(7 * 4) + (6 / 2)

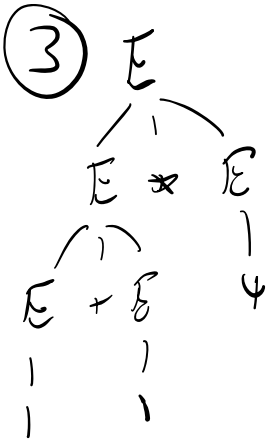
③ $E \Rightarrow E*E$
$\Rightarrow E*4$
$\Rightarrow E+E*4$
$\Rightarrow E+1*4$
$\Rightarrow 1+1*4$

right-most derivation

④ $E \Rightarrow E+E$
$\Rightarrow E-E+E$
✗

① 

② 

③ 

Def: A grammar is ambiguous if some string w has more than one parse tree.

Equivalently: A grammar is ambiguous if there is more than one left-most derivation for some string.

Ex. A

G_1:

$S \to \varepsilon$

$S \to aSa$

$S \to bSb$

G_2:

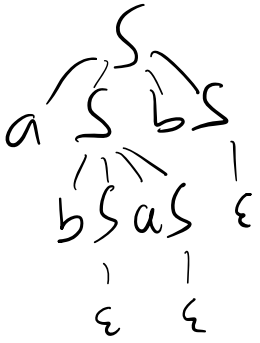
$S \to \varepsilon$

$S \to aSbS$

$S \to bSaS$

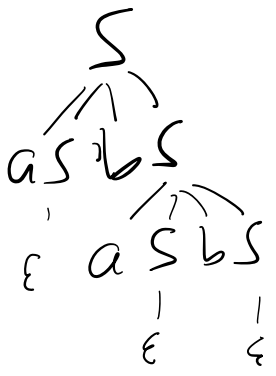
$S \Rightarrow aSbS$

$abSaSbS$

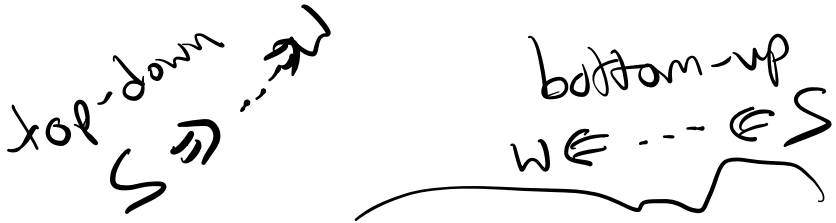


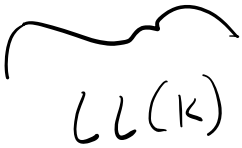
$S \Rightarrow aSbS$

$aSbaSbS$



Backtracking





LL(k)

LL(1)

left-to-right
leftmost derivation
1 token of lookahead

LR(k)

right-most
derivation

LALR

look-ahead
Left to right
rightmost