## Parsing Context Free Grammar

1  $S \to AB \mid BA$    2  $A \to BA \mid a$

3  $B \to CC \mid b$    4  $C \to AB \mid a$

|  | b | a | a | b | a |
|---|---|---|---|---|---|
| 1 | B | A,C | A,C | B | A,C |
| 2 | S,A | B | S,C | S,A | |
| 3 | ∅ | B | B | | |
| 4 | ∅ | S,A,C | | | |
| 5 | A,S / C | | | | |

(length — left axis labels 1,2,3,4,5)

corresponds to a substring and the N.T. that can derive it.

If $S \overset{*}{\underset{?}{\to}} S_{1,n}$

$S_{i,j}$ : substring starting with $x_i$ of length $j$

Eg. $S_{1,1} = b$   $S_{2,3} = aab$   etc.

If $S \overset{*}{\to} baaba$ then

either $S \to AB \overset{*}{\to} \overbrace{ba}^{A}\,\overbrace{aba}^{B}$

or $S \to BA \overset{*}{\to} baaba$

$i$ (starting position)

$j$ (length)

$i, j$
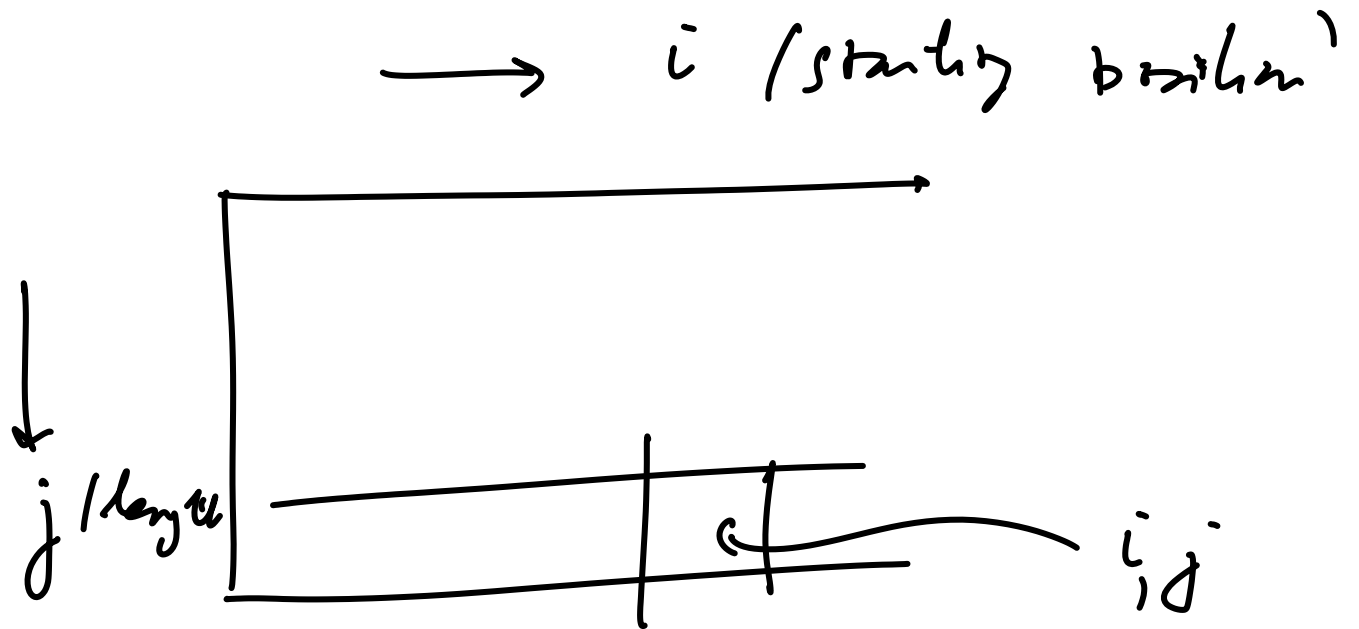
what is the number of steps to fill up the entry $i, j$ ?
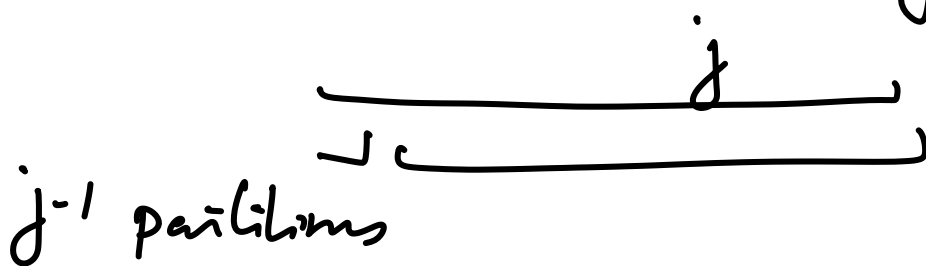
$j-1$ partitions

$j \times m \times k$

$m =$ max no. of rules corresponding to a specific N.T.

For each rule we must check each partition

$k = $ # non terminals

Total time : $\displaystyle\sum_{j=1}^{n} (n-j)(j\,m\,k)$

← # entries in row $j$

$\leq mk \cdot n \cdot n^2$

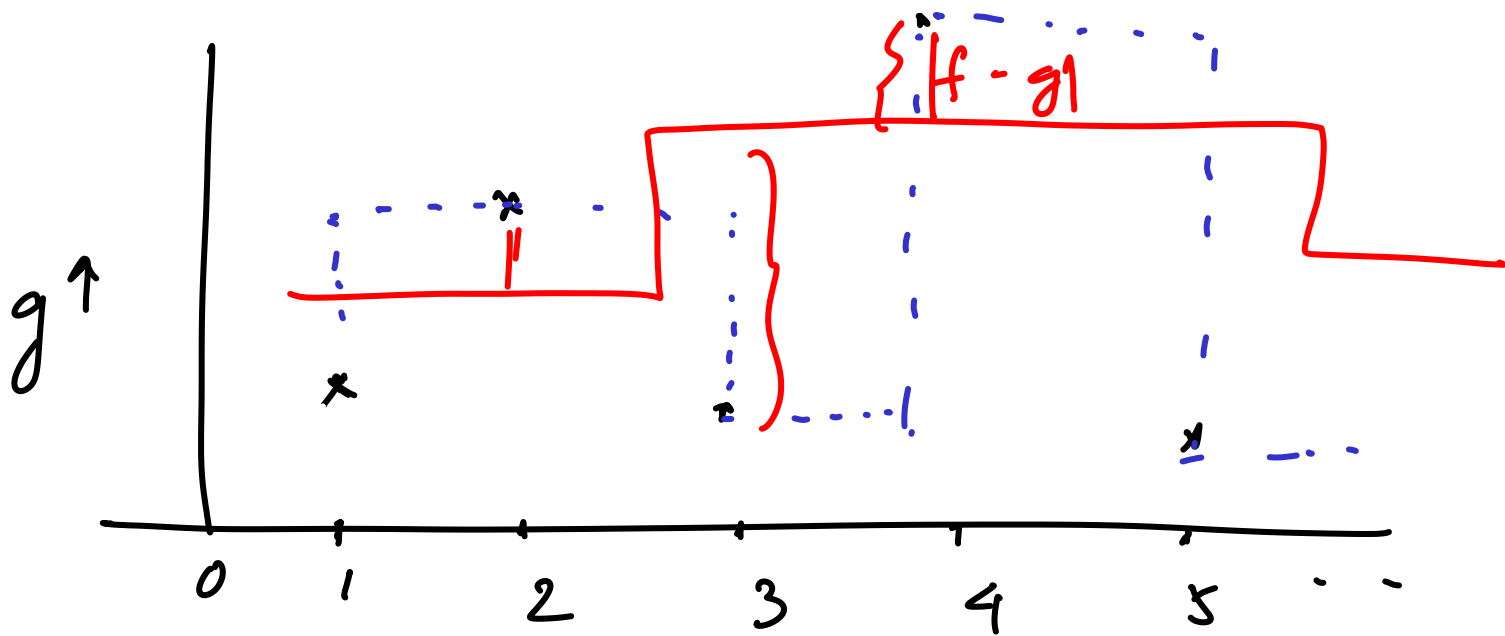$$\leq m \cdot k \cdot n^3$$

is $O(n^3)$ if $m, k$ are
constants

Space : The entire table
has to be retained

$$O(n^2)$$

CYK algorithm

# Function Approximation

Discrete function defined at integral points



$g \uparrow$

$\{ |f - g| \}$

Representation of the function $g$
is $(0, g_0)\ (1, g_1)\ (2, g_2)\ \ldots\ (n, g_n)$

$m$ points can be stored, say $f$

$$m \ll n$$

Minimise the sum of the squares of the difference of $f$ and $g$.