Exercise sheet 8: Suffix-Trees

Exercise 1

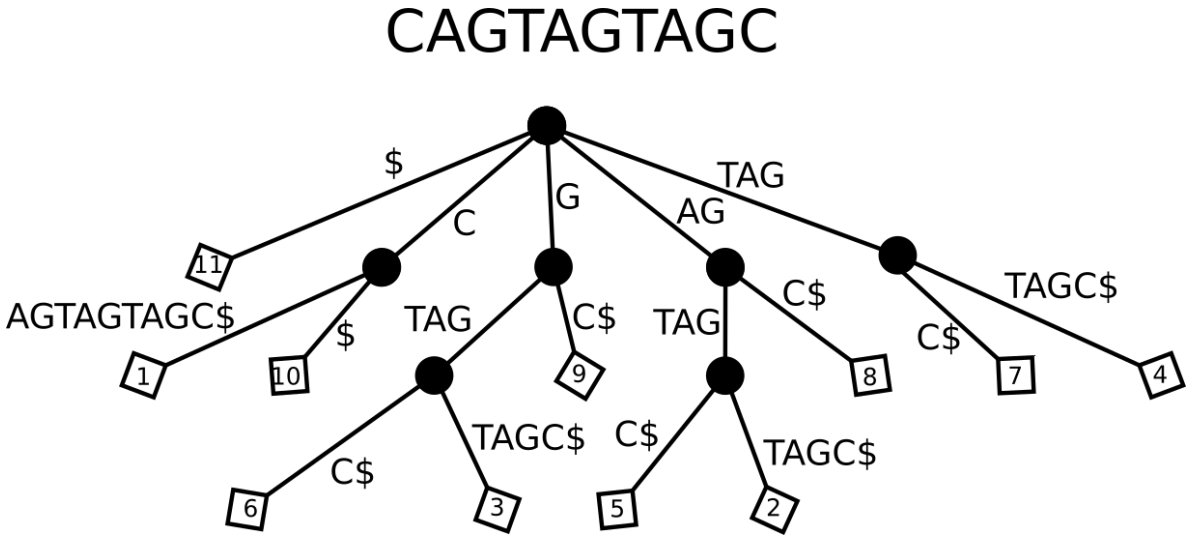
You are given the text T=`CAGTAGTAGC`.

1a)

Draw the corresponding suffix tree!

Hide

Solution



1b)

Describe the steps of a counting query for $P =$ `TAG`.

Hide

Solution

- start at root node
- locate outgoing edge that starts with T
- match subsequent characters of the pattern
- in the subtree rooted at TAG count the number of leaves $\Rightarrow 2$

1c)

Describe the steps of a reporting query for $P =$ `AG`.

Hide

Solution

- start at root node
- locate outgoing edge that start with A
- match subsequent characters of the pattern
- in the subtree rooted at AG report the labels of all leaves $\Rightarrow \{2, 5, 8\}$

Exercise 2

2a)

Draw a generalized suffix tree for the sequences $A =$`CCATG` and $B =$ `CATG`.

Hide

Hint 1 Concatenate the two sequences using a unique character for splitting. e.g. `CCATG#CATG$`.

Dont forget to include suffix links!

Formulae $sl(v) = w$

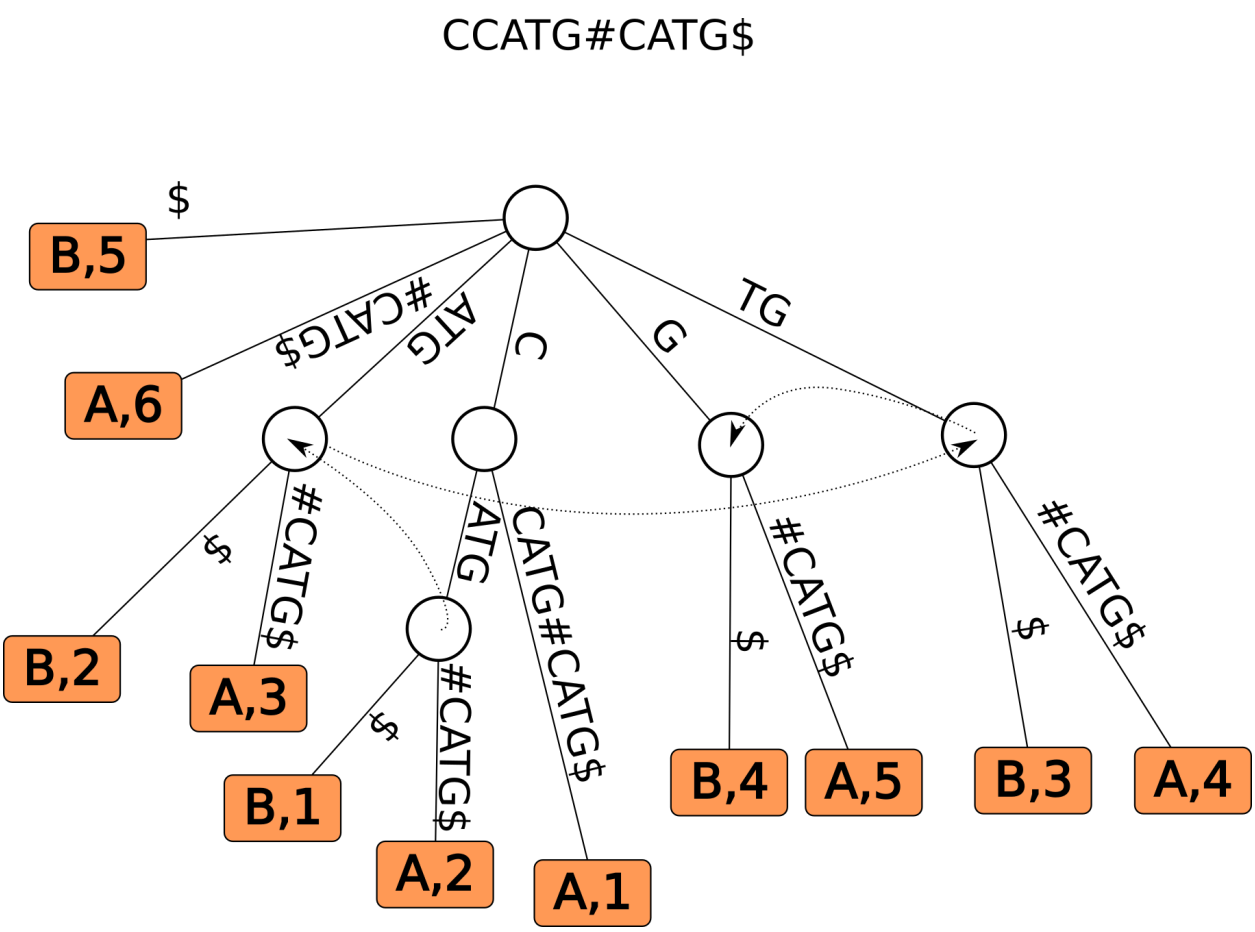
$\overline{v} = cb$

$\overline{w} = b$

$c : character, b : string$

remember: $\overline{v}$ denotes the concatenation of all path labels from the root to v.

Solution



2b)

Find the Maximal Unique Matches of the sequences A =`CCATG` and B =`CATG` using the tree from A).

Hide

Solution `CATG` is the only MUM as $\overline{v}$ = `CATG` has no suffix links pointing to it

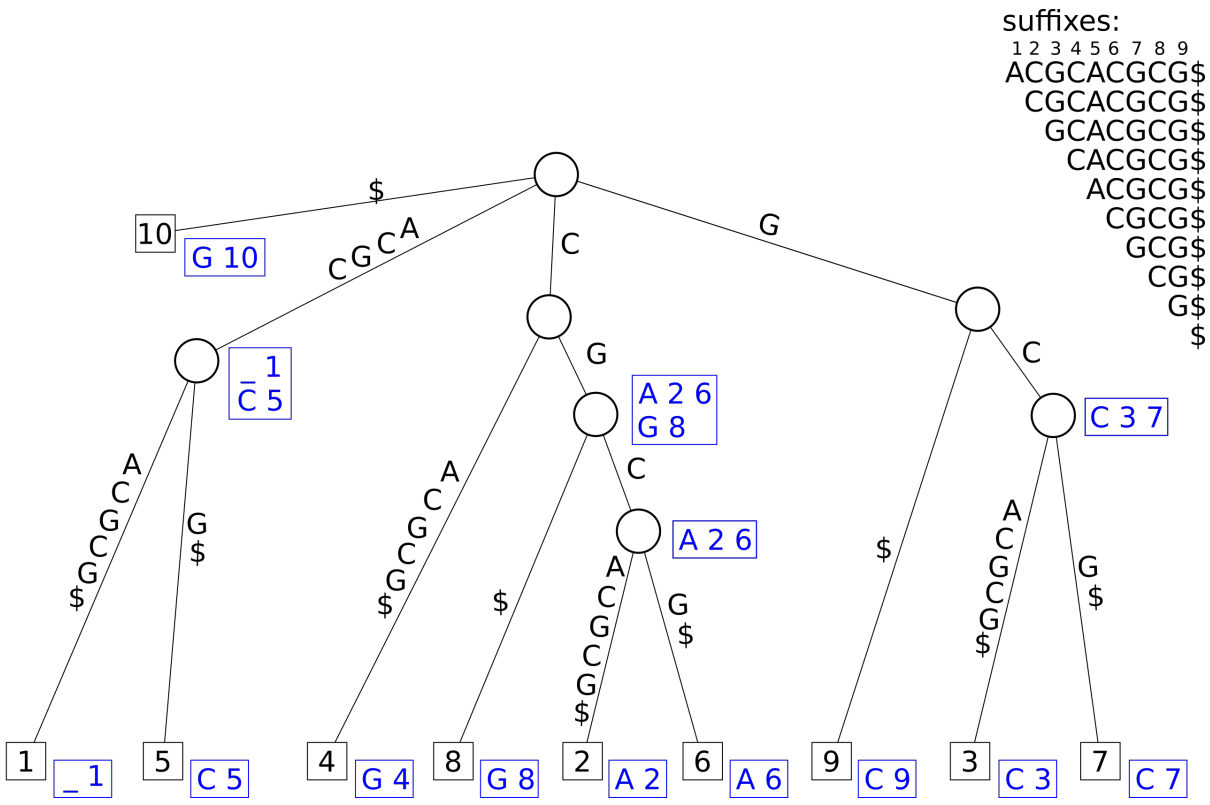
Exercise 3

3a)

Draw a generalized suffix tree for the sequence A =`ACGCACGCG`.

Hide

Solution



3b)

Find all maximal pairs of length at least 2.

Hide

Solution `ACGC`: $(1, 5, 4)$

`CG`: $(2, 8, 2), (6, 8, 2)$

3c)

Why is `C`: $(2, 8, 1)$ not a maximal pair?

Hide

Solution It is not right maximal. This can be seen since `CG`: $(2, 8, 2)$ already includes the indices 2 and 8 with a longer match.