

Longest Common Subsequence

Definition

- a c b a
- a b a

{b, a}
{a}
{b}

{a, b}

{a, b, a}

, {a, a}

$lcs(acba, cba) = 3$

Intuition

- a b c d
- a c d

$lcs(abcd, acd)$

$\rightarrow 1 + lcs(abc, ac)$

$\rightarrow 1 + lcs(ab, \emptyset)$

$\rightarrow \max \{ lcs(a, a), lcs(ab, "") \}$

$1 + lcs("", "")$

$lcs(abcd, acd)$

		a	c	d
a	0	1	1	1
b	0	1	1	1
c	0	1	2	2
d	0	1	2	3

acd

Sequence Alignment (global)

Intuition

A B C C
B C C D

"A B C C -"
"- B C C D"

A B C C
B C C D

- A B C C D
- A C C

A B C C D
A - C C -

A B C C D
- A C C -

A B C C D
A - C - C

↑ ! = match
-1 = mismatch
-2 = gap

+ ← reward
0 ← reward
- ← penalty

	-	A	C	C
-	0	-2	-4	-6
A	-2	1	-1	-3
B	-4	-1	0	-2
C	-6	-3	0	1
C	-8	-5	-2	1
D	-10	-7	-4	-1

$\left. \begin{array}{l} A \\ A \end{array} \right\} \begin{array}{l} - \\ A \end{array} \left. \begin{array}{l} A \\ A \end{array} \right\}$
 max $\left\{ \begin{array}{l} 0 + 1 \uparrow \\ -2 -2 \uparrow \\ -2 -2 \leftarrow \end{array} \right.$

max $\left\{ \begin{array}{l} -4 -1 \\ -6 -2 \\ -1 -2 \end{array} \right\}$
 ↑ ↑ ←

A B C C D
A - C C -