

Homework #14 Key

Gene Alignment

Indels	5	Cost table
Substitutions	1	
Matches	-3	

	<i>empty string</i>	A	T	G	C	C
<i>empty string</i>	0	5	10	15	20	25
T	5	1	2	7	12	17
A	10	2	2	3	8	13
C	15	7	3	3	0	5
G	20	12	8	0	4	1
C	25	17	13	5	-3	1
A	30	22	18	10	2	-2

To obtain the extraction, start from the bottom right and follow the implicit back-pointers to the origin. Two strings are created, representing the various changes that need to be made in order to reach the lowest cost match. A move leftward represents an insertion in the top (horizontal) string. A move upward represents an insertion in the left (vertical) string. A move leftward and upward represents a match/substitution; a character is inserted in both strings.

“, “

‘A’, ‘C’

‘CA’, ‘CC’

‘GCA’, ‘GCC’

‘CGCA’, ‘TGCC’

‘ACGCA’, ‘ATGCC’

‘TACGCA’, ‘-ATGCC’

Knapsack Problem

Given objects with weights (1,2,5,6,7) and values (1,7,11,21,31) and a sack that can carry a weight 10, consider the following table. The entry in the i th row and j th column represents the maximum value you can get from the first i objects with a capacity j . We will assume that there is only one of each object.

Maximum value at weight

(w,v)	0	1	2	3	4	5	6	7	8	9	10
(1,1)	0	1	1	1	1	1	1	1	1	1	1
(2,7)	0	1	7	8	8	8	8	8	8	8	8
(5,11)	0	1	7	8	8	11	12	18	19	19	19
(6,21)	0	1	7	8	8	11	21	22	28	29	29
(7,31)	0	1	7	8	8	11	21	31	32	38	39

The maximum value is 39 and that knapsack configuration comprises $\{(7,31),(2,7),(1,1)\}$.