

4 Exercises – Local alignment

1. Local alignment with DP

The DP algorithm can be used to identify optimal local alignments. Assume the scoring scheme as match: 1, mismatch: -1, and gap penalty: 1.

(a) Complete the DP table to find the optimal local alignment.

q	d	J	A	V	N	N
		1	2	3	4	5
J	1					
A	2					
V	3					
A	4					
A	5					

(b) Backtrack from $H_{9,6}$ and write down the local alignment.

q	d	F	U	N	J	A	V	N	N	O	T
		1	2	3	4	5	6	7	8	9	10
		0	0	0	0	0	0	0	0	0	0
F	1	0	1	0	0	0	0	0	0	0	0
U	2	0	0	2	1	0	0	0	0	0	0
N	3	0	0	1	3	2	1	0	1	1	0
T	4	0	0	0	2	2	1	0	0	0	1
O	5	0	0	0	1	1	1	0	0	1	0
N	6	0	0	0	1	0	0	1	1	0	0
J	7	0	0	0	0	2	1	0	0	0	0
A	8	0	0	0	0	1	3	2	1	0	0
V	9	0	0	0	0	0	2	4	3	2	1
A	10	0	0	0	0	0	1	3	3	2	1

2. Dot matrix

A dot matrix is one of the simplest methods to identify local alignments.

(a) Fill the table with dots.

	d	F	U	N	J	A	V	N	N	O	T
q		1	2	3	4	5	6	7	8	9	10
F	1										
U	2										
N	3										
T	4										
O	5										
N	6										
J	7										
A	8										
V	9										
A	10										

(b) Identify all segment pairs with at least 3 contiguous dots along diagonals.

(c) Identify all segment pairs with at least 3 contiguous dots along anti-diagonals.