Introduction to Bioinformatics

Assignment #1

Part (4):

Sequence (1): CTATTGAACAT

Sequence (2): CTATTGACGTAACAT

Global Alignment:

Gap Score:	-3
Match Score	4
Mismatch Score:	-1

$S_{0,0}$ = Max(0+4,-3-3,-3-3) = Max(4,-6,-6) = 4
$S_{0,1}$ = Max(-3-1,-6-3,4-3) = Max(-4,-9,1) = 1
$S_{0,2}$ = Max(-6-1,-9-3,1-3) = Max(-7,-12,-2) = -2
$S_{0,3}$ = Max(-9-1,-12-3,-2-3) = Max(-10,-15,-5) = -5
$S_{0,4}$ = Max(-12-1,-15-3,-5-3) = Max(-13,-18,-8) = -8
$S_{0,5}$ = Max(-15-1,-18-3,-8-3) = Max(-16,-21,-11) = -11

And so on…

	-	C	T	A	T	T	G	A	C	G	T	A	A	C	A	T
-	0	-3	-6	-9	-12	-15	-18	-21	-24	-27	-30	-33	-36	-39	-42	-45
C	-3	4	1	-2	-5	-8	-11	-14	-17	-20	-23	-26	-29	-32	-35	-38
T	-6	1	8	5	2	-1	-4	-7	-10	-13	-16	-19	-22	-25	-28	-31
A	-9	-2	5	12	9	6	3	0	-3	-6	-9	-12	-15	-18	-21	-24
T	-12	-5	2	9	16	13	10	7	4	1	-2	-5	-8	-11	-14	-17
T	-15	-8	-1	6	13	20	17	14	11	8	5	2	-1	-4	-7	-10
G	-18	-11	-4	3	10	17	24	21	18	15	12	9	6	3	0	-3
A	-21	-14	-7	0	7	14	21	28	25	22	19	16	13	10	7	4
A	-24	-17	-10	-3	4	11	18	25	27	24	21	23	20	17	14	11
C	-27	-20	-13	-6	1	8	15	22	29	26	23	20	22	24	21	18
A	-30	-23	-16	-9	-2	5	12	19	26	28	25	27	24	21	28	25
T	-33	-26	-19	-12	-5	2	9	16	23	25	32	29	26	23	25	32

Solution:

- CTATTGA - - - - ACAT
  ||||||| ||||
  CTATTGACGTAACAT
- CTATTG - - - - AACAT
  |||||| |||||
  CTATTGACGTAACAT
- CTATT - - - G - AACAT
  ||||| | /////
  CTATTGACGTAACAT
- CTATTGA - - - A - CAT
  |||||||| / ///
  CTATTGACGTAACAT

Local Alignment:

	-	C	T	A	T	T	G	A	C	G	T	A	A	C	A	T
-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	0	4	1	0	0	0	0	0	4	1	0	0	0	4	1	0
T	0	1	8	5	4	4	1	0	1	3	5	2	0	1	3	5
A	0	0	5	12	9	6	3	5	2	0	2	1	6	3	5	2
T	0	0	4	9	16	13	10	7	4	1	0	0	3	5	2	9
T	0	0	4	6	13	20	17	14	11	8	5	2	0	2	4	6
G	0	0	1	3	10	17	24	21	18	15	12	9	6	3	1	3
A	0	0	0	5	7	14	21	28	25	22	19	16	13	10	7	4
A	0	0	0	4	4	11	18	25	27	24	21	23	20	17	14	11
C	0	4	1	1	3	8	15	22	29	26	23	20	22	24	21	18
A	0	1	3	5	2	5	12	19	26	28	25	27	24	21	28	25
T	0	0	5	2	9	6	9	16	23	25	32	29	26	23	25	32

Solution:

- CTATTGA - - - - ACAT
  ||||||| ||||
  CTATTGACGTAACAT
- CTATTG - - - - AACAT
  |||||| |||||
  CTATTGACGTAACAT
- CTATT - - - G - AACAT
  ||||| | /////
  CTATTGACGTAACAT
- CTATTGA - - - A - CAT
  ||||||| / ///
  CTATTGACGTAACAT
- CTATTGAACAT
  ||||||| || |
  CTATTG - ACGT
- CTATTGAACAT
  ||||||| | |
  CTATTGA - CGT

$S_{0,0}$ = Max(0+4,0-3,0-3,0) = Max(4,-3,-3,0) = 4
$S_{0,1}$ = Max(0-1,0-3,4-3,0) = Max(-1,-3,1,0) = 1
$S_{0,2}$ = Max(0-1,0-3,1-3,0) = Max(-1,-3-2,0) = 0
$S_{0,3}$ = Max(0-1,0-3,0-3,0) = Max(-1,-3,-3,0) = 0
$S_{0,4}$ = Max(0-1,0-3,0-3,0) = Max(-1,-3,-3,0) = 0
$S_{0,5}$ = Max(0-1,0-3,0-3,0) = Max(-1,-3,-3,0) = 0
$S_{0,6}$ = Max(0-1,0-3,0-3,0) = Max(-1,-3,-3,0) = 0
$S_{0,7}$ = Max(0+4,0-3,0-3,0) = Max(4,-3,-3,0) = 4

And so on…