

Lecture: Bioinformatics I

WS 2015/16

Assignment No. 5

(6 points)

Hand out:

Monday, November 9

Hand in due:

Monday, November 16, 10:15

Direct inquiries to alexander.seitz@uni-tuebingen.de

Theoretical Assignments

1. Comparison with at most l mismatches

(1P, 0.5h)

Let the two sequences A and B of length t have at most l mismatches. Given that

$$k \leq \left\lfloor \frac{t}{l+1} \right\rfloor$$

How many k -tuples do A and B share? What if $k = \left\lfloor \frac{t}{l+1} \right\rfloor$?

2. Linear programming by hand

(5P, max. 3h)

Given the following linear inequalities:

$$\begin{array}{rcllcl} \text{max.} & s & x_1 & + & t & x_2 & & \\ \text{s.t.} & 2 & x_1 & + & & x_2 & \leq & 12 \quad (1) \\ & & x_1 & + & & x_2 & \leq & 7 \quad (2) \\ & 2 & x_1 & + & 3 & x_2 & \leq & 16 \quad (3) \\ & -1 & x_1 & + & 2 & x_2 & \leq & 6 \quad (4) \\ & & x_1, x_2 & & & & \geq & 0 \end{array}$$

solve the following tasks:

- Draw the feasible region of the linear program
- Solve the linear program for $s = t = 1$
- give another constraint so that the program is not solvable
- Give a value to s and t so that the linear program has infinite solutions ($s, t \neq 0$)
- For **each** of the following points, give a value to s and t ($s, t \neq 0$) so that the respective point is the only optimal solution. Justify why there are no other solutions.

$$P_1 = (0, 3)$$

$$P_2 = (2, 4)$$

$$P_3 = (1, 3)$$

$$P_4 = (6, 0)$$

3. ***Bonus: Carillo-Lipman bound**

(1P)

What does the Carrillo-Lipman bound assert for the 2-sequence case?

4. ***Project: Hand in revised project proposal and milestones plan**

(Counts for project)

This assignment sheet No. 5 is a reduced assignment to give all teams time to set up the projects, revise those proposals that have been suggested by yourself and hand-in the revised project proposal following the ‘template’ of the projects proposed by us (see ILIAS). In addition each group is asked to set up a milestone plan and also hand that in. Note: Deadline for this task (only!) is **Nov 18!**

Please read the questions carefully. If there are any questions, you may ask them during the tutorial session or via e-mail to your tutor. You will usually get an answer in time, but late e-mails (e.g. on Monday morning before class) might not be answered in time. Please send all your electronic solutions to `alexander.seitz@uni-tuebingen.de` or `alexander.peltzer@uni-tuebingen.de` (depending on your tutor). Please pack both your source code as well as the theoretical part into one single archive file. Source code should compile correctly. Make sure, that you export the source code and not only the binaries. Handwritten assignment solutions (e.g. for the theoretical part) can be turned in during the lecture.