Sequence Analysis SS 2014 Freie Universität Berlin, Institut für Informatik Knut Reinert, David Weese, Sommersemester 2014

6. Exercise sheet, June 3rd, 2014 Discussion: June 12th, 2014

Exercise 1.

Nussinov SCFG

- a) Formulate the inside and outside algorithm for the Nussinov SCFG.
- b) Show how to use your inside and outside variables to calculate the probability that positions *i* and *j* are base-paired, summed over all structures.

Exercise 2.

Context free RNA grammars

Consider the hairpin loop CFG from the lecture:

- 1. Write derivations for $s_1 = CAGGAAACUG$ and $s_2 = GCUGCAAAGC$.
- 2. Consider the complete language generated by the CFG from the lecture. Write a regular grammar that generates exactly the same language. Does this seem like a good idea?

Exercise 3.

CNF

Convert the production rule $W \rightarrow aWbWWc$ (a, b, c terminal symbols) into Chomsky normal form. If the probability of the original production is p, show the probabilities for the production is normal form.

Exercise 4.

Covariance models

Build a covariance model for the alignment of RNAs. Visualize it as a tree, like presented in the lecture.