Algorithms in Comparative Genomics

Bielefeld University, WS 2019/20
Dr. Roland Wittler

https://gi.cebitec.uni-bielefeld.de/teaching/2019winter/cg

Exercise sheet 2, 24.10.2019

Exercise 1 (DCJ distance and sorting)
Given the following two genomes:

$$A = \{1_t, 1_h4_h, 4_t2_t, 2_h3_t, 3_h5_t, 5_h7_t, 7_h6_t, 6_h8_t, 8_h11_h, 11_t9_t, 9_h10_t, 10_h12_t, 12_h\}$$
$$B = \{1_t, 1_h2_t, 2_h3_t, 3_h4_t, 4_h5_t, 5_h6_t, 6_h7_t, 7_h8_t, 8_h9_t, 9_h10_t, 10_h11_t, 11_h12_t, 12_h\}$$

1. Draw the genome graphs of A and B.
2. Draw the adjacency graph of A and B.
3. What is the DCJ distance between A and B?
4. Give an optimal DCJ sorting scenario from A to B. Name the operations in your sorting scenario.
5. If any of your intermediate genomes contains a circular intermediate chromosome, try to find an alternative optimal scenario that does not contain such a chromosome.

Exercise 2 (Number of DCJ scenarios)
How many different optimal DCJ sorting scenarios can you find for the following two genomes?

$$A = [1]\ [4, 3, 2, 5]$$
$$B = [1, 2, 3, 4, 5]$$

Exercise 3 (Paths in the adjacency graph)
Given a genome A with l_A linear chromosomes, and a genome B with l_B linear chromosomes, how many paths does the adjacency graph of A and B have?