Exercises – Phylogenetics

Exercise Sheet 9 — 07.12.2017

Due: 14.12.2017

Task 1 Neighbor Joining. **(8 points)**

Reconstruct a phylogenetic tree from the following matrix. Use

(a) WPGMA,

(b) Waterman's algorithm and

(c) *Neighbor Joining.*

	A	B	C	D	E
A :	0	8	5	8	2
B :		0	8	6	6
C :			0	8	4
D :				0	6
E :					0

Write down all steps.

Hint: When performing Waterman's algorithm, start with the two taxa A and B, and try to add all taxa to their edge first. As soon as this is not possible anymore, continue with the path between A and C. You might get negative edge weights.

Task 2 Minimum Evolution. **(5 points)**

Write a linear program (LP) that calculates the *minimum evolution tree* (ME tree) for the distance matrix from Task 2 on exercise sheet 8 and the tree topology resulting for the UPGMA method.

Use an online solver to get a solution for it, for instance:

- http://www.zweigmedia.com/RealWorld/simplex.html or

- http://www.phpsimplex.com/simplex/simplex.htm?l=en.

Send your LP to your T.A.[1]

What are the minimum total edge length and the individual edge lengths?

In comparison, the resulting topology for UPGMA has a total edge length of 29. Compare these results and the results from Task 2 on exercise sheet 8.

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