Universität Greifswald
Institute für Mathematik and Informatik
Lecturer: Marc Hellmuth Tutor: Nikolai Nøjgaard

10. Exercise "Bioinformatics", SS 17

Aufgabe 1: (5 Credits)
Determine whether the triple sets $R_1 = \{ab|g, ac|g, de|g, ef|g, df|g\}$ and $R_2 = \{ab|g, ac|g, de|g, ef|g, df|g, cd|g, ec|d, cf|d, fd|e\}$ are consistent. To this end, apply the BUILD-algorithm and give the resulting tree obtained with BUILD, if there is one. In addition, determine a tree with a minimum number of interior vertex for the consistent set(s) R_i.

Aufgabe 2: (7.5 Credits)
A metric $D : X \times X \to \mathbb{R}$ is an ultrametric if for all $x, y, z \in X$ we have

$$D(x, y) \leq \max\{D(y, z), D(x, z)\}.$$

Prove the 3-point condition:
D is an ultrametric if and only if for all $x, y, z \in X$ the two largest elements in $\{D(x, y), D(y, z), D(x, z)\}$ are equal.

Aufgabe 3: (7.5 Credits)
Let R be a consistent triple set and assume that $R' = R \cup \{ab|c\}$ is not consistent. Let $\mathcal{L} = \cup_{xy|z \in R'}\{x, y, z\}$.
Show, there is a subset $L \subseteq \mathcal{L}$ with $|L| \geq 3$ such that the Ahograph $[R, L]$ has exactly two connected components, one containing a and the other b.

Deadline: Tuesday - June 20, 2017