

TABLE 27.9. Example of UPGMA tree construction

Step	Cycle 1	Cycle 2	Cycle 3	Cycle 4	Cycle 5	Cycle 6
Distance matrix	OTUs A B C D E B 2 C 4 4 D 6 6 6 E 6 6 6 4 F 8 8 8 8 8	OTUs AB C D E C 4 D 6 6 E 6 6 4 F 8 8 8 8	OTUs AB C DE C 4 DE 6 6 DE 8 8 8	OTUs ABC DE DE 6 F 8 8	OTUs ABCDE F 8	No new matrix
Identify smallest D	$A \leftrightarrow B = 2$	$AB \leftrightarrow C = 4$ $D \leftrightarrow E = 4$	$AB \leftrightarrow DE = 6$ $C \leftrightarrow DE = 6$	$ABC \leftrightarrow DE$	$ABCDE \leftrightarrow F$	
Taxa joined	A and B	D and E	AB and C	ABC and DE	ABCDE and F	
Subtree						
Comments on tree drawing	The distance between A and B is 2 units. A subtree is drawn with the branch point halfway between the two. Thus, each branch is 1 unit in length.	Branching done as in Step 1. Because the distance from AB to C is also 4, that pair could have been selected as well.	First a subtree is drawn with AB and C: The the AB subtree is attached to the AB branch at a point equal to the length of the A and B branches.	The tree is first done as in Step 3 with the ABC and DE subtrees replacing the branches.	The tree is now complete but unrooted.	The tree can then be rooted using midpoint rooting which tries to balance all the tips to reach the same end point. Note this is the tree that we started with to build the distance matrix.

From <http://www.icp.ucl.ac.be/~opperd/private/upgma.html>.