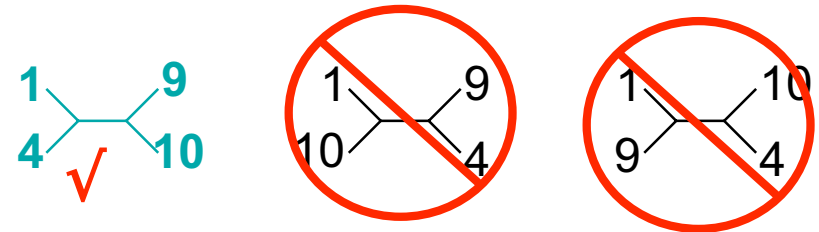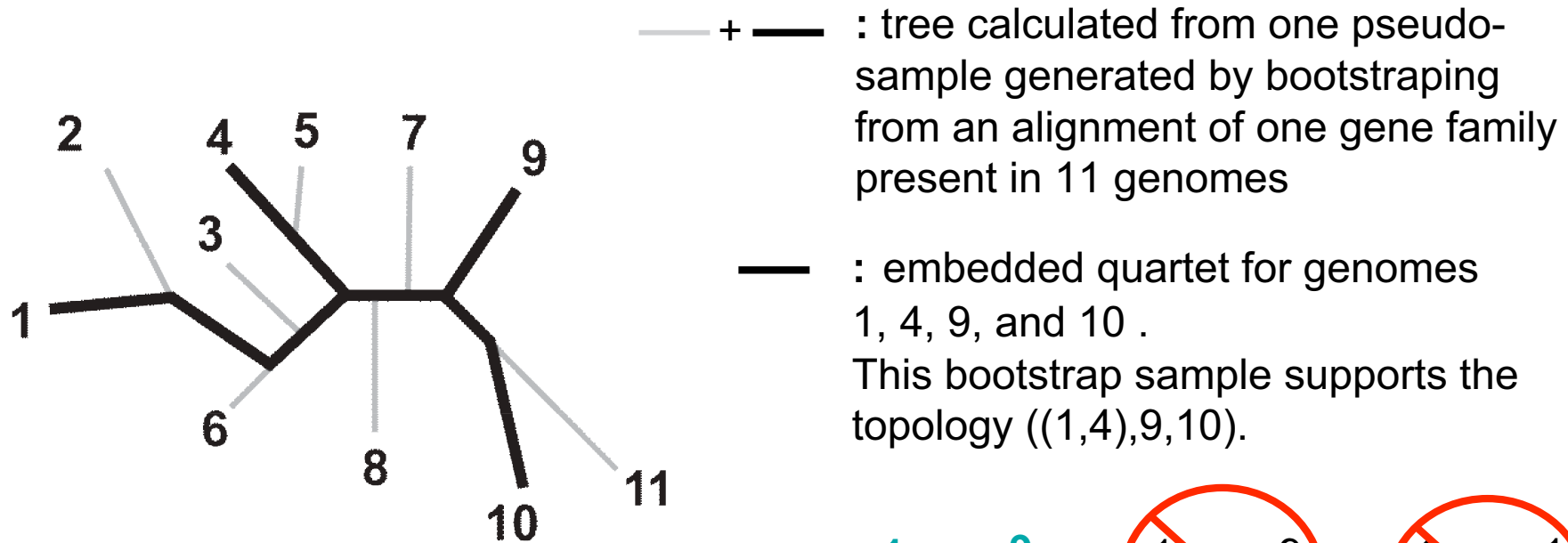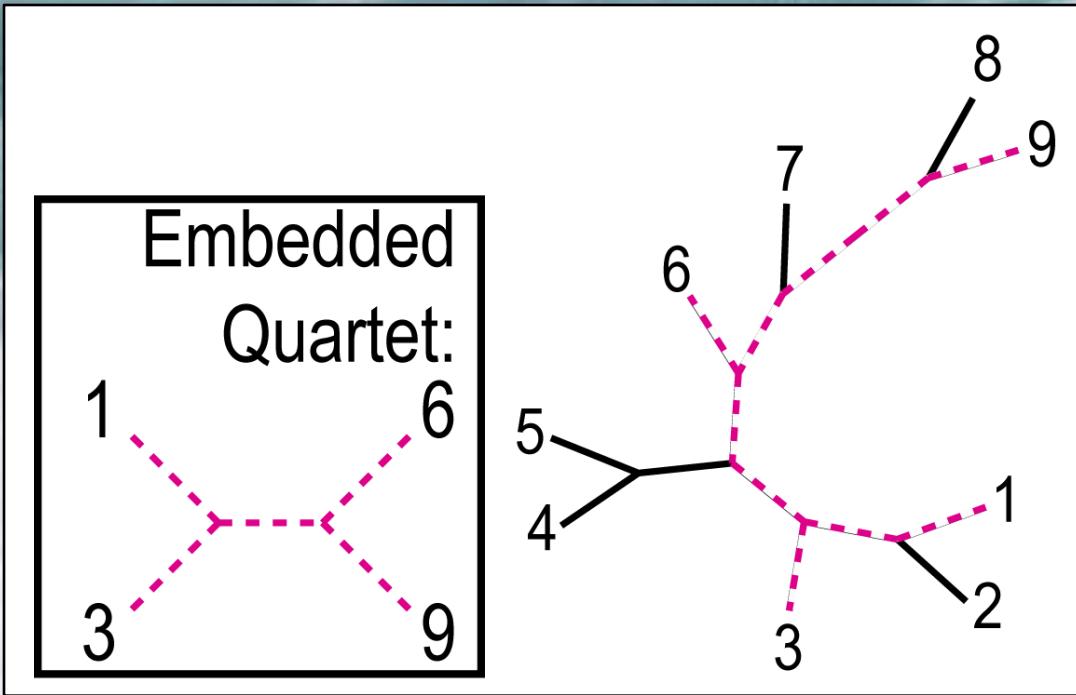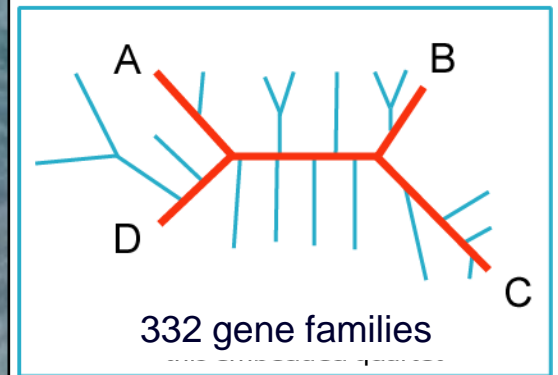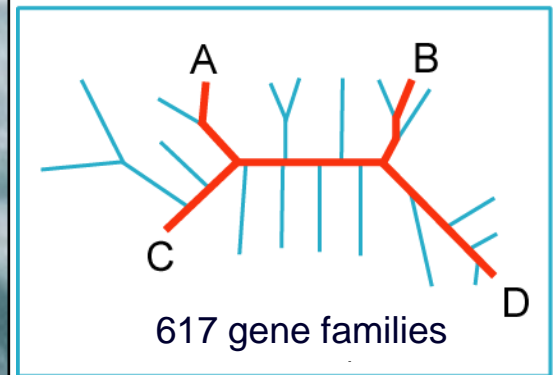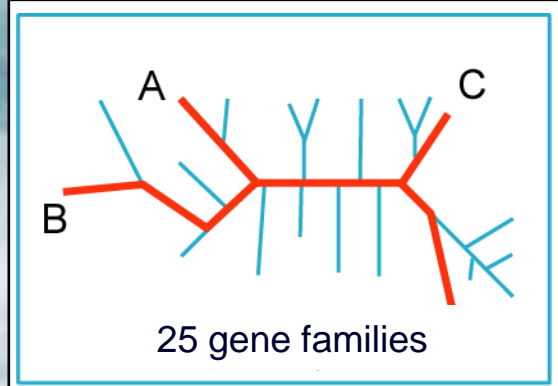# Bootstrap support values for embedded quartets

Quartet spectral analyses of genomes iterates over three loops:
- Repeat for all bootstrap samples.
- Repeat for all possible embedded quartets.
- Repeat for all gene families.

QUARTET DECOMPOSITION METHOD

Embedded Quartet:

- Quartet is a smallest unit of phylogenetic information

- Each quartet is associated with only three unrooted tree topologies

25 gene families

617 gene families

332 gene families

BOOTSTRAP SUPPORT
VALUE VECTOR:
(2.6, 63.3, 34.1)
974 gene families contain
this embedded quartet

20 bootstrap samples support this embedded quartet

10 bootstrap samples support this embedded quartet

70 bootstrap samples support this embedded quartet
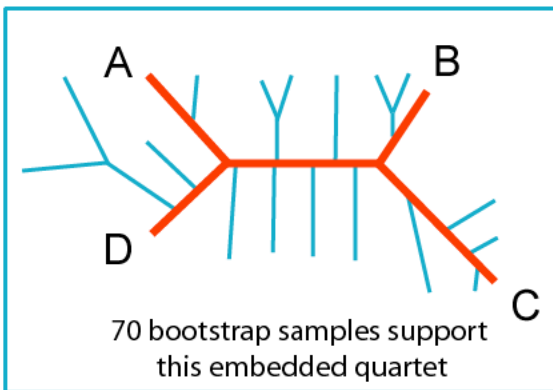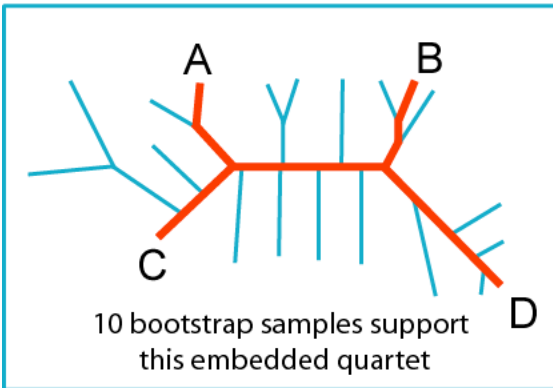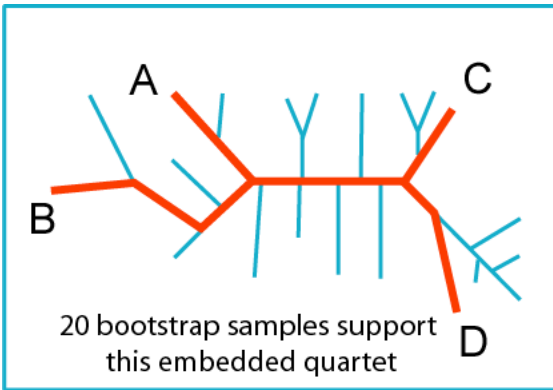
BOOTSTRAP SUPPORT
VALUE VECTOR:
(20,10,70)

Calculation of bootstrap support vector for an embedded quartet

• Topology reconstructed from a bootstrap sample is examined for embedded topology of a quartet of interest.

• For a quartet, there are three possible unrooted tree topologies.

• **Bootstrap support vector** for a single gene family consists of percent of bootstrap samples supporting each of the three tree topologies.
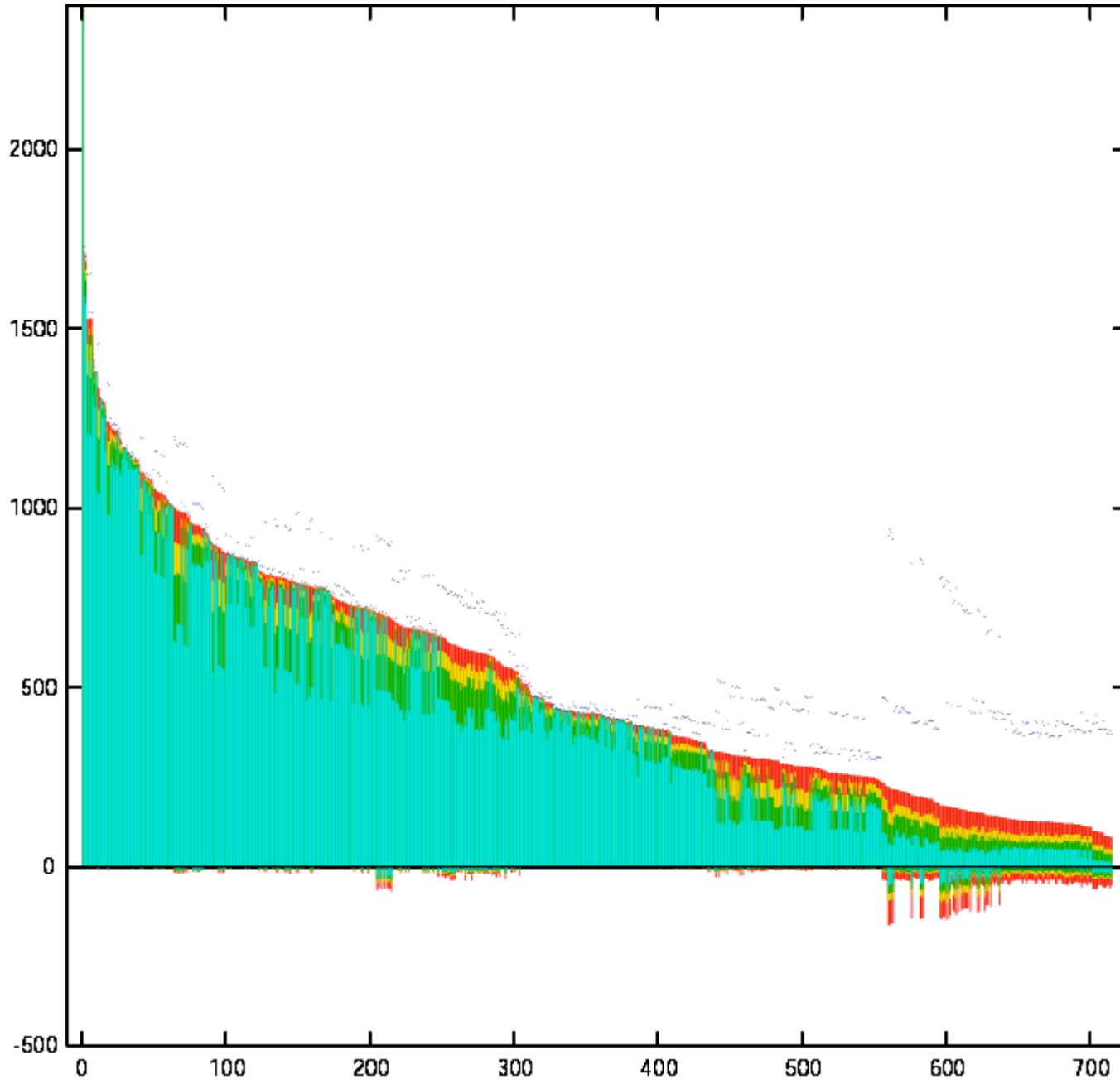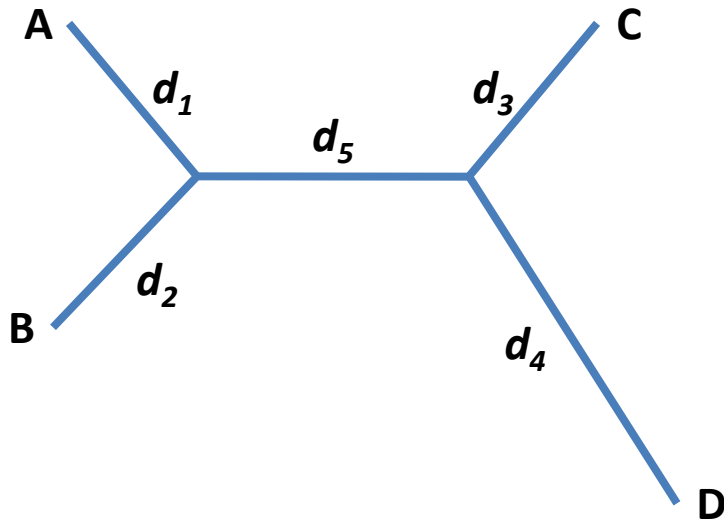
Illustration of a component of quartet spectral analyses
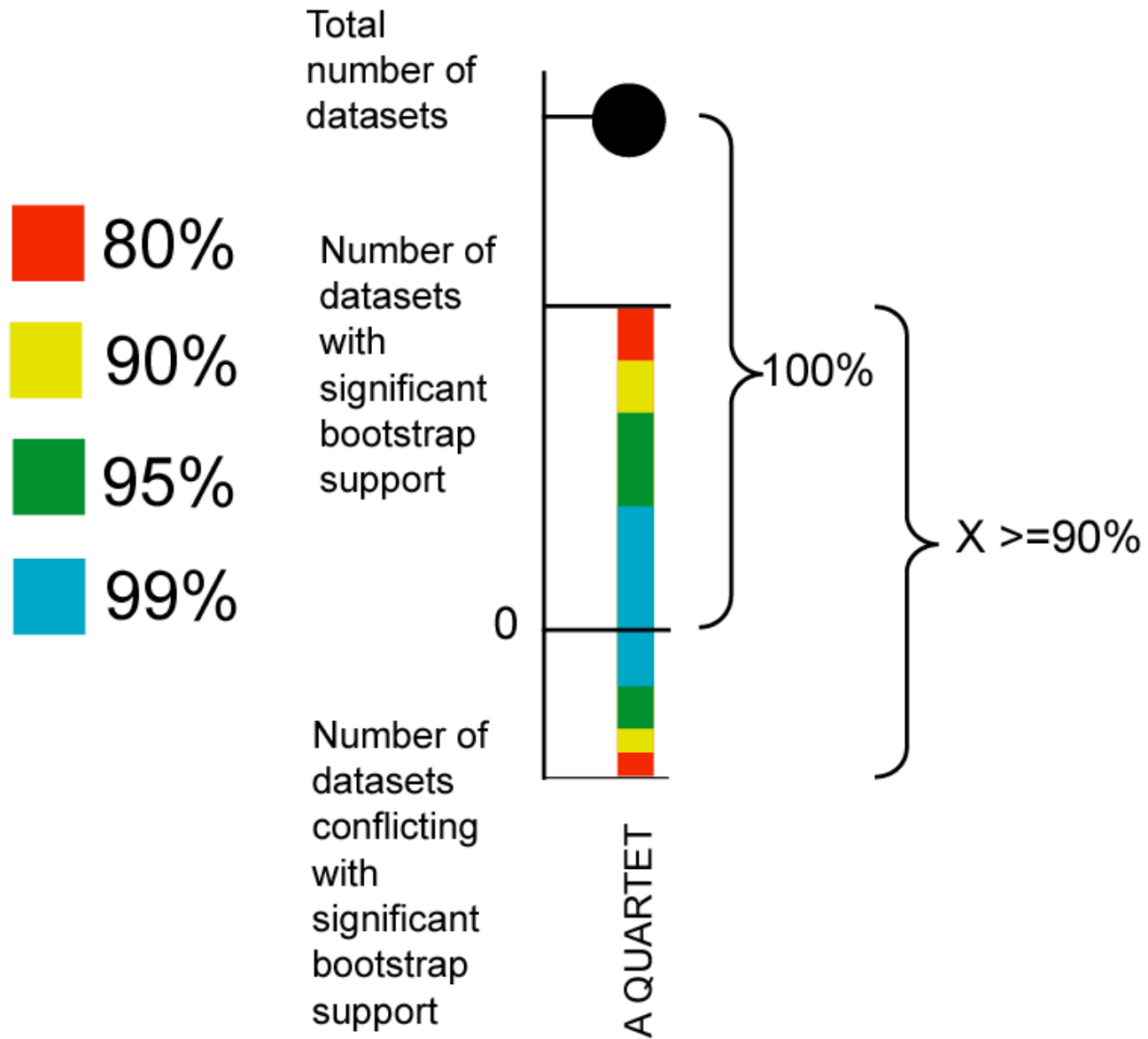
Spectral Quartet analyses of datasets from S^0
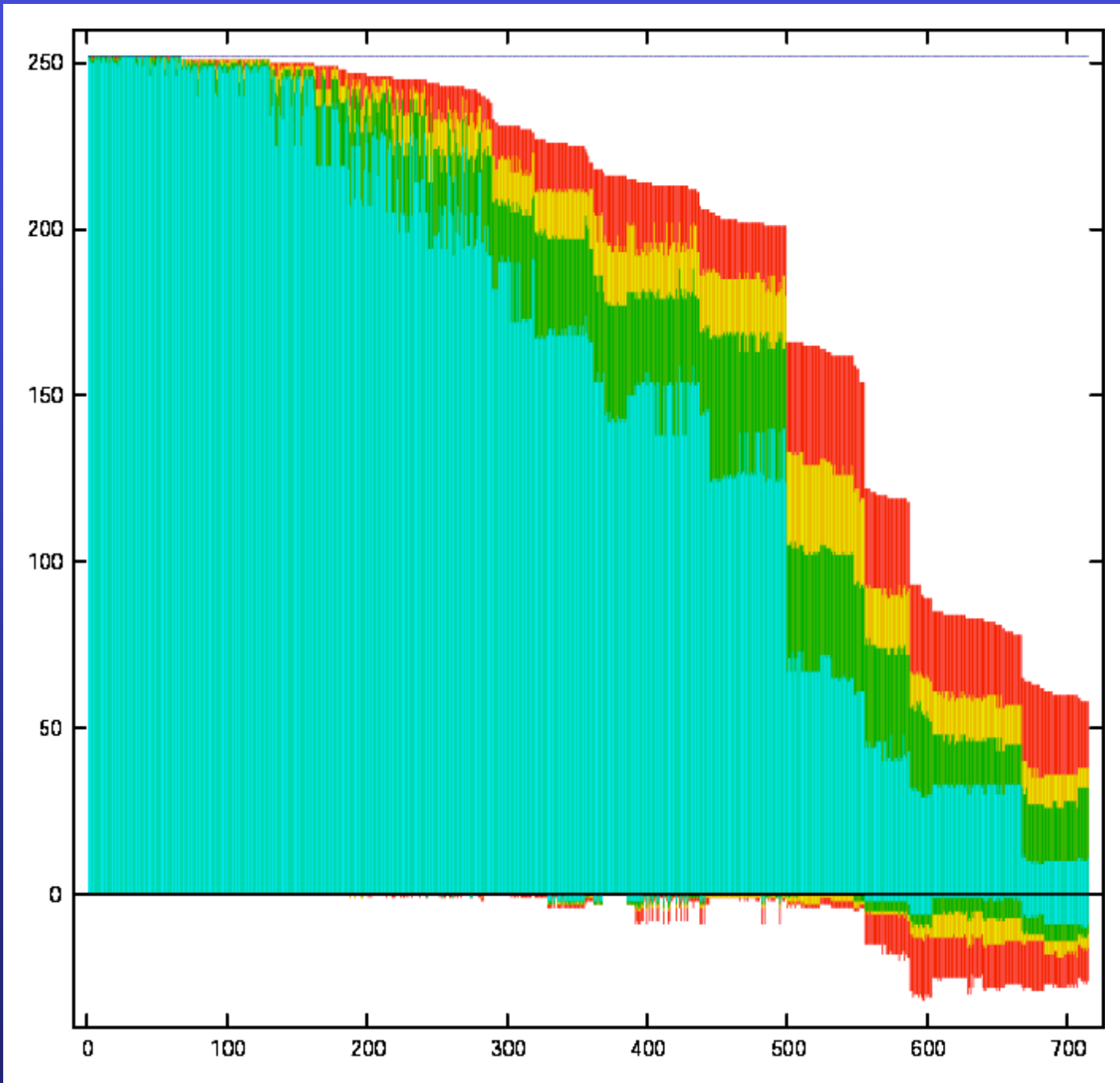
Spectral Quartet analyses of all (4540) datasets

Quartet filters

- *The quartet at the left is generated from a gene tree.*
- d_1, d_2, d_3 *and* d_4 *are lengths of external branches in the quartets for taxon A, B, C and D, respectively.* d_5 *is the length of the internal branch.*
- *Quartet filter 1: if* $d_5 \leq 0.02$ *(or another user specified value), this quartet will not be counted.*
- *Quartet filter 2: if the longest external branch (* d_4 *in the quartet) is too much longer than the internal branch, say,* $d_4 / d_5 \geq 10$*, this quartet will not be counted.*
- *Quartet filter 3: Since each quartet has a bootstrap support value in each gene family, the user can remove the quartets which are not well supported in most gene families. We suggest the user don't use this filter (or use 0,0 as thresholds). The user can try this filter with different thresholds after the job is done.*