

RAxML - Randomized Accelerated Maximum Likelihood

<http://sco.h-its.org/exelixis/web/software/raxml/index.html>

control via command line or it is possible to install graphical user interface (<http://sourceforge.net/projects/raxmlgui/>), which requires python

exe binaries for Windows are available at https://github.com/stamatak/standard-RAxML/tree/master/WindowsExecutables_v8.2.10

Basic command line parameters

-m substitution model specifications
-p random seed
-t starting tree (if not specified a parsimonious tree is build using randomized stepwise addition)
-s name of the input file (in phylip or fasta format)
-# number of repetitions
-n suffix for resulting files

1. ML with binary data matrix

raxmlHPC -m BINGAMMA -p 12345 -s binary.phy -# 20 -n resultBIN

- uses GAMMA rate heterogeneity model for substitutions of binary data
- 20 repetitions (with different starting tree)

2. ML with data matrix

raxmlHPC -m GTRGAMMA -p 12345 -s dna.phy -# 20 -n resultDNA

3. bootstrapping

a) first it is necessary to find (best-scoring ML tree)

raxmlHPC -m GTRGAMMA -p 12345 -# 20 -s dna.phy -n bestML

- generates 20 trees, the best one is saved to the file RAxML_bestTree.bestML

b) next step is to conduct a bootstrap analysis

raxmlHPC -m GTRGAMMA -p 12345 -b 12345 -# 100 -s dna.phy -n boot

- generates 100 bootstrap matrices

- trees based on all bootstrap matrices are saved to the file RAxML_bootstrap.boot

c) bootstrap values are mapped onto the best ML tree

raxmlHPC -m GTRGAMMA -p 12345 -f b -t RAxML_bestTree.bestML -z RAxML_bootstrap.boot -n finalboot

- two files are created: RAxML_bipartitions.finalboot (bootstrap values as node labels) and

RAxML_bipartitionsBranchLabels.finalboot (bootstrap values as branch annotations) – possible to open in, e.g., FigTree

4. rapid bootstrapping

- much faster than standard bootstrap

- full analysis (ML search + bootstrapping) in a single step

raxmlHPC -f a -m GTRGAMMA -p 12345 -x 12345 -# 100 -s dna.phy -n rbs

- a file RAxML_bipartitions.rbs is created – best ML tree with mapped bootstrap values