Three Genes Convergence Plots

This document contains plots and statistics for evaluating the convergence of 3_genes MrBayes runs performed in this paper. Assessment of convergence used the web address http://danwarren.net/plot-comparisons.html written by the authors of the package **RWTY**.

It seems that both 3_genes runs have converged. The approximate sampling Estimated Sample Size (ESS) and topology ESS are both above 200 (standard rule of thumb). The tree topology trace shows well-mixed chains and a clear optimum, cumulative split frequencies seem to have become fairly stable, and sliding window split frequencies show large jumps, but a clear search of the tree space. Both runs also seem to have converged on similar posterior probabilities, as shown by the split frequency comparisons. The average standard deviation of split frequencies (ASDSF) is below 0.01 and shows a consistent decrease, as expected. Tree space plots show both runs searching similar areas of tree space and well-mixed chains. The topological autocorrelation plots also appear to have reached a plateau for each run.

**Analysis code**

```
library(rwty)

## Loading required package: ape
## Loading required package: ggplot2
library(ape)

# Pull in the trees (only need to indicate a folder)
my.trees <- load.multi("3_genes_longer_run", format='mb')

## [1] "clad_3_OGs_taxrem_fixed.nex.run1.t"
## [1] "clad_3_OGs_taxrem_fixed.nex.run2.t"

# Set burn in
burnin_val <- 25000

# Analysis of trees using **RWTY**
my.trees.rwty <- analyze.rwty(my.trees, burnin=burnin_val, fill.color='LnL')
```

```
## [1] "Creating trace for pi.A."
## [1] "Creating trace for pi.C."
## [1] "Creating trace for pi.G."
## [1] "Creating trace for pi.T."
## [1] "Creating trace for alpha"
## [1] "Creating trace for m.i."
## [1] "Creating trace for tree topologies"
## [1] "Calculating approximate ESS with sampling intervals from 1 to 100"
## [1] "Creating topological autocorrelation plot"
## [1] "Creating sliding window split frequency plot for 20 clades"
## [1] "Creating sliding window ACSF plot"
## [1] "Creating cumulative split frequency plot for 20 clades"
## [1] "Creating cumulative ACSF plot"
## [1] "Creating treespace plots"

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## Warning: `panel.margin` is deprecated. Please use `panel.spacing` property instead

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## [1] "Creating ASDSF plot"
## [1] "Creating split frequency matrix and ASDSF clustering plots"

# Approximate ESS for topologies
topological.approx.ess(my.trees,burnin=burnin_val)

## [1] "Calculating approximate ESS with sampling intervals from 1 to 100"

```r
## operator approx.ess chain
## 1 = 10172.91 clad_3_OGs_taxrem_fixed.nex.run1.t
## 2 = 17064.23 clad_3_OGs_taxrem_fixed.nex.run2.t
```
Plots

Estimated Sample Size

```r
makeplot.pseudo.ess(my.trees, burnin = 2500)
```

## [1] "Creating pseudo ESS plot"
## [1] "Calculating pseudo ESS for 97501 trees and 20 replicates, please be patient"
## [1] "Calculating pseudo ESS for 97501 trees and 20 replicates, please be patient"

## $pseudo.ess.plot
Parameter plot

my.trees.rwty$LnL.trace[[1]]

LnL trace

clad_3_OGs_taxrem_fixed.nex.run1.t (ESS=1206)

LnL

clad_3_OGs_taxrem_fixed.nex.run2.t (ESS=158)

my.trees.rwty$LnL.trace[[2]]

LnL trace

clad_3_OGs_taxrem_fixed.nex.run1.t (ESS=1206)

clad_3_OGs_taxrem_fixed.nex.run2.t (ESS=158)
Topology trace plots

my.trees.rwty$topology.trace.plot[[1]]

Tree topology trace

clad_3_OGs_taxrem_fixed.nex.run1.t (Approximate ESS = 8358)

clad_3_OGs_taxrem_fixed.nex.run2.t (Approximate ESS = 8507)

my.trees.rwty$topology.trace.plot[[2]]

Tree topology trace

clad_3_OGs_taxrem_fixed.nex.run1.t (Approximate ESS = 8358)

clad_3_OGs_taxrem_fixed.nex.run2.t (Approximate ESS = 8507)

Generation
Split frequency plots

**Cumulative Split Frequencies for 20 clades**

- `clad_3_OGs_taxrem_fixed.nex.run1.t`

- `clad_3_OGs_taxrem_fixed.nex.run2.t`

**Sliding Window Split Frequencies for 20 clades**

- `clad_3_OGs_taxrem_fixed.nex.run1.t`

- `clad_3_OGs_taxrem_fixed.nex.run2.t`
Split frequency comparisons

3_OGs_taxrem_fixed.nex.

\[ r = 0.99 \]
\[ \text{ASDF} = 0.0075 \]

Average Standard Deviation of Split Frequencies

Standard Deviation of Split Frequencies

Generation

3_OGs_taxrem_fixed.nex.
Tree space plots

my.trees.rwty$treespace.heatmap

Tree space heatmap for 100 trees

my.trees.rwty$treespace.points.plot

Tree space for 100 trees

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Autocorrelation plots

my.trees.rwty$autocorr.plot

Topological autocorrelation plot

clad_3_OGs_taxrem_fixed.nex.run1.t

clad_3_OGs_taxrem_fixed.nex.run2.t

Mean Path Difference between Pairs of Trees

Sampling Interval between Trees