

Analysing Congreve & Lamsdell matrices

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Contents

1	Bayesian analysis	1
2	Parsimony analysis	2
3	Analysing output data	3
	References	3

The files required to reproduce these analyses are included in the R package directory on installation, and can be downloaded from GitHub.

If you have RStudio, you can open the R Markdown file used to generate this document (`vignettes/Conduct-analyses.Rmd`) to run the R scripts that will copy all necessary files and begin analyses on your behalf. You will need to specify some paths for automatic downloading:

```
# Directory in which to install MrBayes
BAYES_DIR <- "C:/Research/MrBayes"

# Directory in which to conduct parsimony analysis
HOME <- "C:/Research/iw" # Must not end in a trailing '/'

# GitHub remote
INST_ROOT <- "https://raw.githubusercontent.com/ms609/CongreveLamsdell2016/master/inst/"
```

1 Bayesian analysis

`bayesgen.pl` is a Perl script to execute analysis using Markov models in MrBayes.

The script reads the datasets of Congreve and Lamsdell [1], appends a MrBayes block to the Nexus files, and executes a MrBayes run, saving the consensus trees and preparing them for analysis in R.

Before running the script:

- Install MrBayes

```
MRBAYES_RELEASE <- "https://github.com/NBISweden/MrBayes/releases/download/v3.2.6/MrBayes-3.2.6_WIN32_x86_64.exe"
zipFile <- paste0(BAYES_DIR, '/MrBayes.zip')
download.file(MRBAYES_RELEASE, destfile=zipFile, method='auto', mode='wb')
unzip(zipFile, c('MrBayes/mrbayes_x64.exe', 'MrBayes/mrbayes_x86.exe'),
      exdir=BAYES_DIR, junkpaths=TRUE)
file.remove(zipFile)
```

- Download Appendix S5 from Congreve and Lamsdell [2] (doi:10.5061/dryad.7dq0j/5%5D(<https://dx.doi.org/10.5061/dryad.7dq0j/5>)) and unzip its 100 nexus files to a local directory (default: `C:/Research/MrBayes/iw`)


```
unzip(zipFile, 'tnt.exe', exdir=HOME)
file.remove(zipFile)
```

- Copy `mptgen.pl` and (optionally) `tnt2nex.pl` into this root directory, updating each file so its variable `$dir` corresponds to the appropriate path.
`tnt2nex.pl` translates TNT output into NEXUS format and may be useful if you wish to perform further analysis of TNT output. This will be performed automatically if you uncomment the final line of `mptgen.pl`.

```
tnt2nexPath <- paste0(HOME, '/tnt2nex.pl')
mptgenPath <- paste0(HOME, '/mptgen.pl')

download.file(paste0(INST_ROOT, "analysis-parsimony/tnt2nex.pl"), tnt2nexPath)
tnt2nex <- readLines(tnt2nexPath)
tnt2nex[3] <- paste0('$dir = "', HOME, '/Trees";')
writeLines(tnt2nex, tnt2nexPath)

download.file(paste0(INST_ROOT, "analysis-parsimony/mptgen.pl"), mptgenPath)
mptgen <- readLines(mptgenPath)
mptgen[3] <- paste0('$dir = "', HOME, '";')
writeLines(mptgen, mptgenPath)
```

- Copy the file `tnt_template.run` into the root directory.

```
download.file(paste0(INST_ROOT, "analysis-parsimony/tnt_template.run"),
             paste0(HOME, '/tnt_template.run'))
```

- Download Appendix S1 from Congreve and Lamsdell [2] (doi:10.5061/dryad.7dq0j/1) and unzip its 100 text files to `Matrices`.

```
tempFile <- tempfile(fileext='.zip')
download.file("https://datadryad.org/bitstream/handle/10255/dryad.101095/S1%20-%20TNT%20files.zip", tempFile)
unzip(tempFile, exdir=paste0(HOME, '/Matrices'))
```

- Perform the analyses by executing `mptgen.pl`. (Once Perl is installed, you can just double-click the file.)

3 Analysing output data

Once these analyses have generated the necessary data, these can be analysed using the scripts in [<https://github.com/ms609/CongreveLamsdell2016/blob/master/data-raw/GenerateData.Rmd>]. The results of these analyses are available in the R data objects; to view them, install the package in R and view the help files.

References

1. Congreve CR, Lamsdell JC. 2016 Implied weighting and its utility in palaeontological datasets: a study using modelled phylogenetic matrices. *Palaeontology* **59**, 447–465. (doi:10.1111/pala.12236)
2. Congreve CR, Lamsdell JC. 2016 Data from: Implied weighting and its utility in palaeontological datasets: a study using modelled phylogenetic matrices. *Dryad Digital Repository*, doi:10.5061/dryad.7dq0j. (doi:10.5061/dryad.7dq0j)