

# Documentation for Wag2020 Program

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## 0.1 Introduction

This is the first version of documentation for the program Wag2020. This program is designed to produce a variety of phylogenetic distance-based trees and output the result in multiple formats as well. All source code, precompiled binaries, test data, and documentation are available from <https://github.com/wardwheeler/wag2020>.

This first version is brief.

## 0.2 Input Distance Matrix Format

Graphs may be input in the graphviz “dot” format <https://graphviz.org/>, Newick (as interpreted by Gary Olsen; [https://evolution.genetics.washington.edu/phylip/newick\\_doc.html](https://evolution.genetics.washington.edu/phylip/newick_doc.html)), Enhanced Newick Cardona et al. (2008), and Forest Enhanced Newick (defined by Wheeler, 2020) formats.

Quickly, Forest Enhanced Newick (FEN) is a format based on Enhanced Newick (Enewick) for forests of components, each of which is represented by an Enewick string. The Enewick components are surrounded by ‘<’ and ‘>’. As in <(A, (B,C)); (D,(E,F));>. Groups may be shared among Enewick components.

## 0.3 Output Formats

Graph outputs can be in either Graphviz ‘dot’ or Newick formats. Dot files can be visualized in a variety of ways using Graphviz (e.g. dot, neanto, twopi) into pdf, jpg and a large variety of other formats. Newick outputs of trees can be visualized in a large number of programs (e.g. FigTree; <http://tree.bio.ed.ac.uk/software/figtree/>)

Example dot command line:

```
dot -Tpdf myDotFile.dot > myDotFile.pdf
```

For some reason on OSX the ‘pdf’ option does not seem to work. You can use ‘-Tps2’ and that will generate a postscript file that preview can read and convert to pdf.

## 0.4 Command options

There are only a few program options that require specification. There are defaults for all but input graphs. Parameters are given with options in a range ‘a to b’ (a-b) with any value in the interval, or alternates ‘a or b’ (a—b). File options require a valid filename. For input graphs, wildcards are allowed (ie ‘\*’ and ‘?’). All commands are followed by a colon ‘:’ before the option with no spaces. Capitalization (for commands, but not filenames) is ignored. Commands can be in any order (or entered from a file as stdin ‘< filename’).

- Reconcile:eun|cun|majority|strict|Adams  
Default:eun

This command specifies the type of output graph. EUN is the Edge-Union-Network Miyagi and Wheeler (2019), CUN the Cluster Union Network (Baroni et al., 2005), majority (with fraction specified by ‘threshold’) specifies that a values between 0 and 100 of either vertices or edges will be retained. If all inputs are trees with the same leaf set this will be the Majority-Rule Consensus (Margush and McMorris, 1981). Strict requires all vertices be present to be included in the final graph. If all inputs are trees with the same leaf set this will be the Strict Consensus (Schuh and Polhemus, 1980). Adams denotes the Adams II consensus (Adams, 1972).

- Compare:Combinable|identity  
Default:combinable  
Species how group comparisons are to be made. Either by identical match [(A, (B,C))≠(A,B,C)], combinable sensu Nelson (1979) [(A, (B,C)) consistent with (A,B,C)]. This option can be used to specify “semi-strict” consensus (Bremer, 1990).
- Threshold:(0-100)  
Default:0  
Threshold must be an integer between 0 and 100 and specifies the frequency of vertex or edge occurrence in input graphs to be included in the output graph. Affects the behavior of ‘eun’ and ‘majority.’
- Connect:True|False  
Default:False  
Specifies the output graph be connected (single component), potentially creating a root node and new edges labeled with “0.0”.
- EdgeLabel:True|False  
Default:True  
Specifies the output graph have edges labeled with their frequency in input graphs.
- OutFormat:Dot|FENewick  
Default:Dot  
Specifies the output graph format as either Graphviz ‘dot’ or FEN.
- OutFile:filename  
Default:euncon.out  
Specifies the output graph file name. No conventions are enforced.
- Any string that does not contain a colon, ‘:’, is assumed to be an input graph file.

The program requires at least one input graph file and at least two input graphs (they could be in the same file).

## 0.5 Program Use

The program is invoked from the command-line as in:

```
euncon reconcile:eun threshold:0 outfile:myOutput graphFile1.dot graphFile2.tre
```

## **Execution in Parallel**

By default the program will execute using a single process core. By specifying the options ‘+RTS -NX -RTS’ where ‘X’ is the number of processors offered to the program. These are specified after the program as in (for 4 parallel threads):

euncon +RTS -N4 -RTS other options...

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