

## Assignment 3 – Exhaustive search (ES) and Branch and bound method (BS)

Use the depth-first algorithm in the text from the handout of lecture 3 as a guide. Add the capability of doing a *exhaustive search* and the *branch-and-bound-method* to your program. this is perhaps the time to install some kind of minimal text-based user interface. Several possibilities work:

- Give a menu with choices: for example have a menu that allows to change between the different tree searching algorithms,

Menu:

```
T Tree search strategy: Exhaustive
```

```
Change the tree search strategy [Exhaustive | Branch-and-bound | ...]?
```

- Allow the user to input commands on a console, for example like MrBayes or Paup: for example you could specify at the prompt:

```
set search=exhaustive
```

or

```
help
```

which might result in something like this:

```
set Syntax: set <option>
```

```
Options:
```

```
search Syntax: search=<method>
```

```
Methods:
```

```
Exhaustive Searches all possible trees and
returns the best or set of best trees
according to the used optimality
criterion.
```

```
Branch-and-bound Searches for the best tree(s)
using the branch-and-bound algorithm.
```

This command line interface is very versatile but you need to help the users to find the appropriate commands.

- Graphical user interface, although we prefer that you do not spend too much time on such an interface, it might be better to choose a simple command line interface that can interact with a GUI, instead of hard-coding it into your program.

## Expectations

- A working program executing an exhaustive search using the given data set(s). The program should report the best tree with its score or the set of best trees with their score. Use either Fitch parsimony or Sankoff or both.
- A working program executing a branch and bound search and reporting the best tree or trees with its score. Use either Fitch parsimony or Sankoff or both.
- Optional: print a histogram that shows the distribution of scores for the exhaustive search.

We expect a working program in the “repository” by next Monday, September 26. Remember you need to name your package with your first name. Upload the complete netbeans folder into the Assignments/Assignment03/your\_name folder on [bsc5936@ronquistg5.csit.fsu.edu](mailto:bsc5936@ronquistg5.csit.fsu.edu).