

```
In [17]: from Bio import Phylo
        from io import StringIO
```

1. Program versions:

- trimal-1.4.1
- modeltest-ng-0.1.7
- raxml-ng-1.2.1
- ggtree v3.8.2
- iqtree-2.2.6

2. Trimming alignment with trimal

```
In [4]: !trimal -in SUP35_aln_prank.best.fas -out SUP35_aln_prank.trim.fas -
        automated1
```

3. Choosing best evolutionary model

```
In [5]: !modeltest-ng -i SUP35_aln_prank.trim.fas -o SUP35_trim_modeltest | grep
        -C 10 'Summary'
```

```
modeltest-ng: Results file SUP35_trim_modeltest.out already exists
modeltest-ng: - Remove the existing files, or
modeltest-ng: - Select a different output basename (-o argument), or
modeltest-ng: - Force overriding (--force argument)
```

4. Build ML-tree based on best model (TIM3+G4)

```
In [6]: !raxml-ng --msa SUP35_aln_prank.trim.fas --model TIM3+G4 --prefix
        SUP35_raxml --threads 2 --seed 222 --outgroup SUP35_Kla_AB039749
```

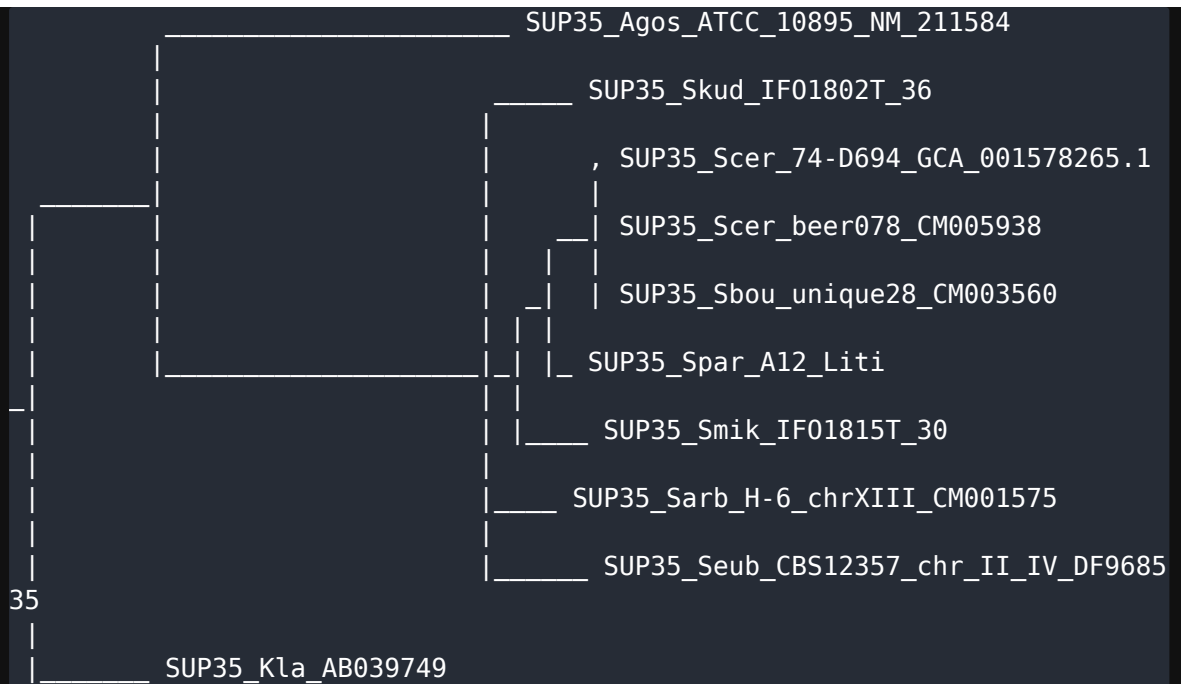
```
ERROR: Result files for the run with prefix `SUP35_raxml` already exist!
Please either choose a new prefix, remove old files, or add --redo command
line switch to overwrite them.
```

5. Visualize this tree

```
In [22]: file = open("SUP35_raxml.raxml.bestTree", "r")
        treedata = file.read()
        file.close()

        handle = StringIO(treedata)
        tree = Phylo.read(handle, "newick")

        Phylo.draw_ascii(tree)
```



6. Choose best model via IQ-TREE

```
In [26]: !iqtree2 -m MFP -s SUP35_aln_prank.trim.fas --prefix SUP35_MF2 | grep
'Best-fit model'
```

Best-fit model: TIM3+F+G4 chosen according to BIC

7. TIM3+F+G4 model has fixed frequencies

8. Building IQ-TREE best tree

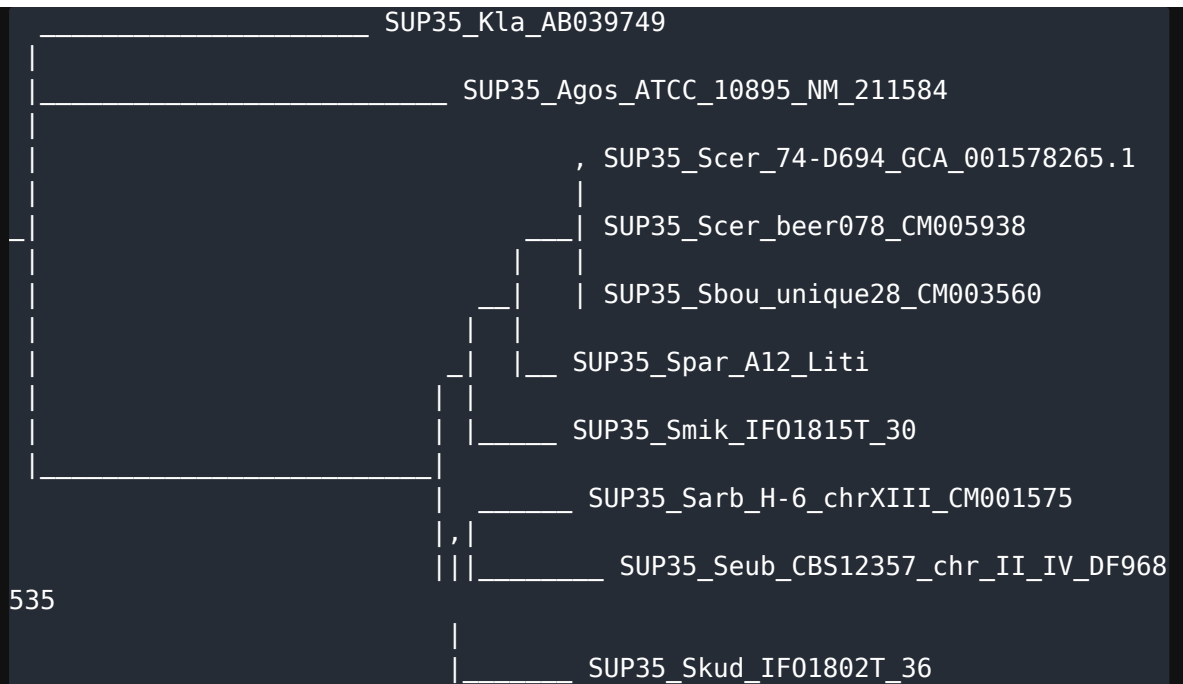
```
In [31]: !iqtree2 -m TIM3+F+G4 -s SUP35_aln_prank.trim.fas --prefix SUP35_iqtree
> /dev/null
```

9. Draw best tree

```
In [27]: file = open("SUP35_MF2.treefile", "r")
treedata = file.read()
file.close()

handle = StringIO(treedata)
tree = Phylo.read(handle, "newick")

Phylo.draw_ascii(tree)
```



10. log-likelihood

In []:

11. Base command for 100 bootstrap replics

In []:

```
!iqtree2 -s SUP35_aln_prank.trim.fas -m TIM3+F+G4 -pre SUP35_TIM3_b -b
10
```

12. Ultra-fast bootstrap 1000

In []:

```
!iqtree2 -s SUP35_aln_prank.trim.fas -m TIM3+F+G4 -redo -pre
SUP35_TIM3_ufb -bb 1000
```

14. • 1000 uftrafast bootstrap + 1000 alrt + abayes

In []:

```
!iqtree2 -s SUP35_aln_prank.trim.fas -m TIM3+F+G4 -pre
SUP35_TIM3_B_alrt_abayes -bb 1000 -alrt 1000 -abayes
```