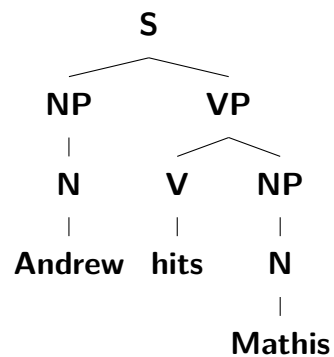


(1) Andrew hits Mathis.

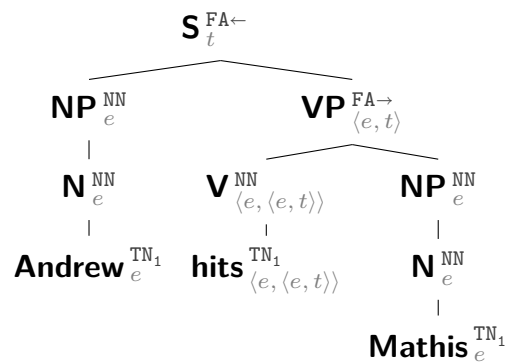
4/15 iterations, 2.91ms

```
[.\node(top){S}; [.NP^1 [.N^1 Andrew ] ] [.VP [.V hits ] [.NP^2 [.N^2 Mathis ] ] ] ]
```

a.



b.

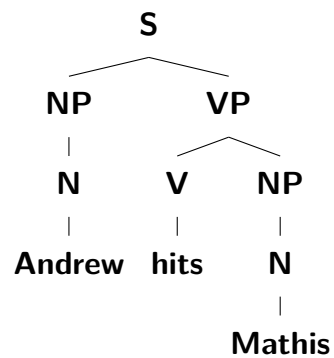


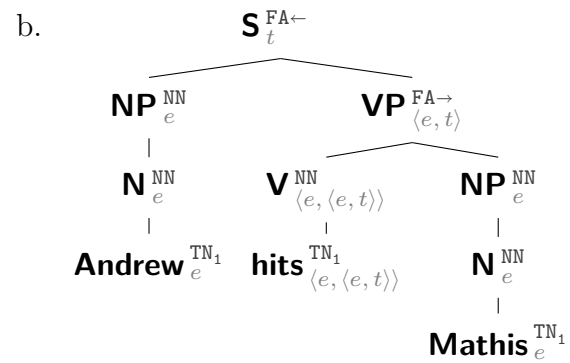
(2) Andrew hits Mathis.

4/15 iterations, 0.33ms

```
[.\node(up){S}; [.NP^1 [.N^1 Andrew ] ] [.VP [.V hits ] [.NP^2 [.N^2 Mathis ] ] ] ]
```

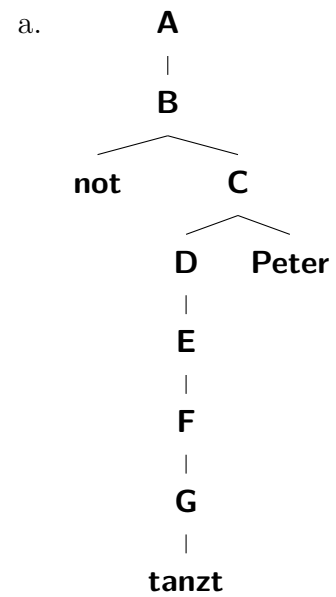
a.



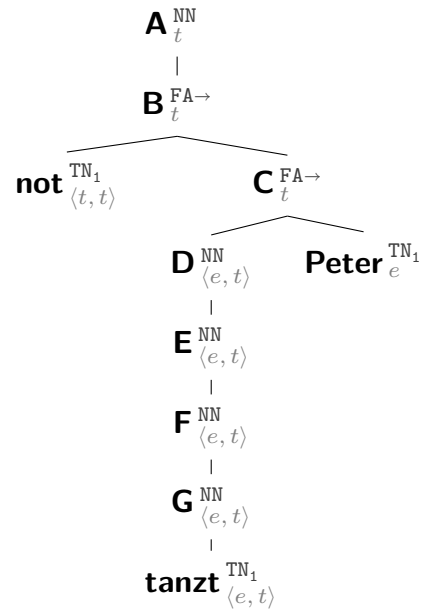


(3) Not tanzt.
`[.\node(top){A}; [.B not [.C [.D [.E [.F [.G tanzt]]]] [.Peter]]]]`

7/15 iterations, 1.46ms



b.

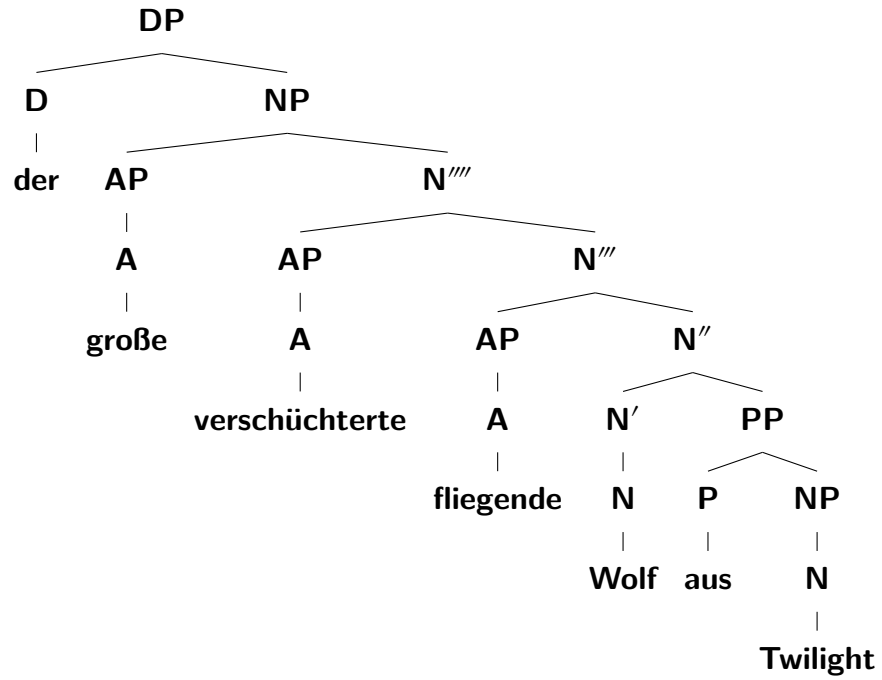


- (4) Der große verschüchterte fliegende Wolf aus Twilight.

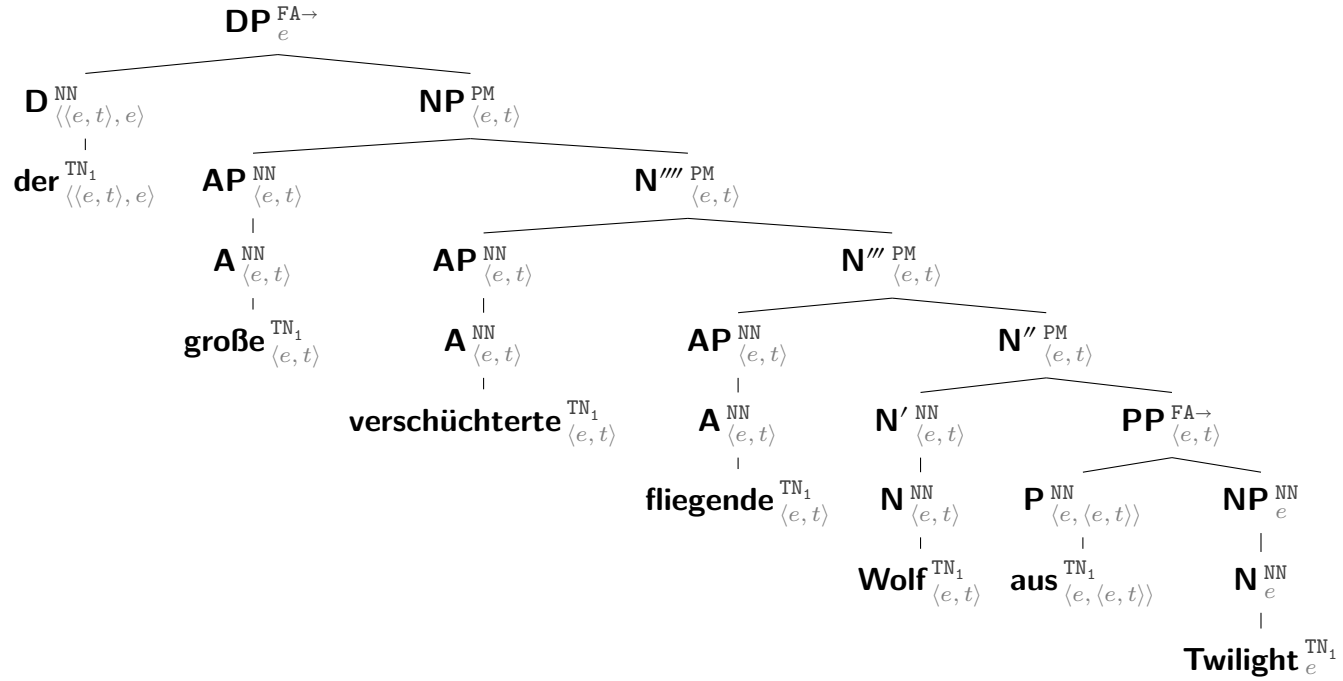
7/15 iterations, 4.10ms

```
[.\node(top){DP}; [.D der ] [.NP [.AP [.A große ] ] [.N$'''$ [.AP^2 [.A^2 verschüchterte ] ] [.N$'''$ [.AP^3 [.A^3 fliegende ] ] [.N$''$ [.N$'$ [.N Wolf ] ] ] [.PP [.P aus ] [.NP^2 [.N^2 Twilight ] ] ] ] ] ] ]
```

a.



b.

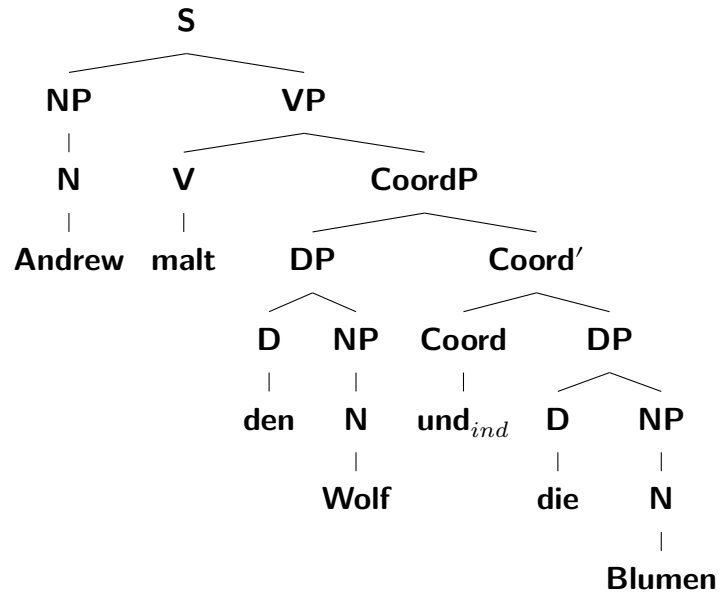


(5) Andrew malt den Wolf und_{ind} die Blumen.

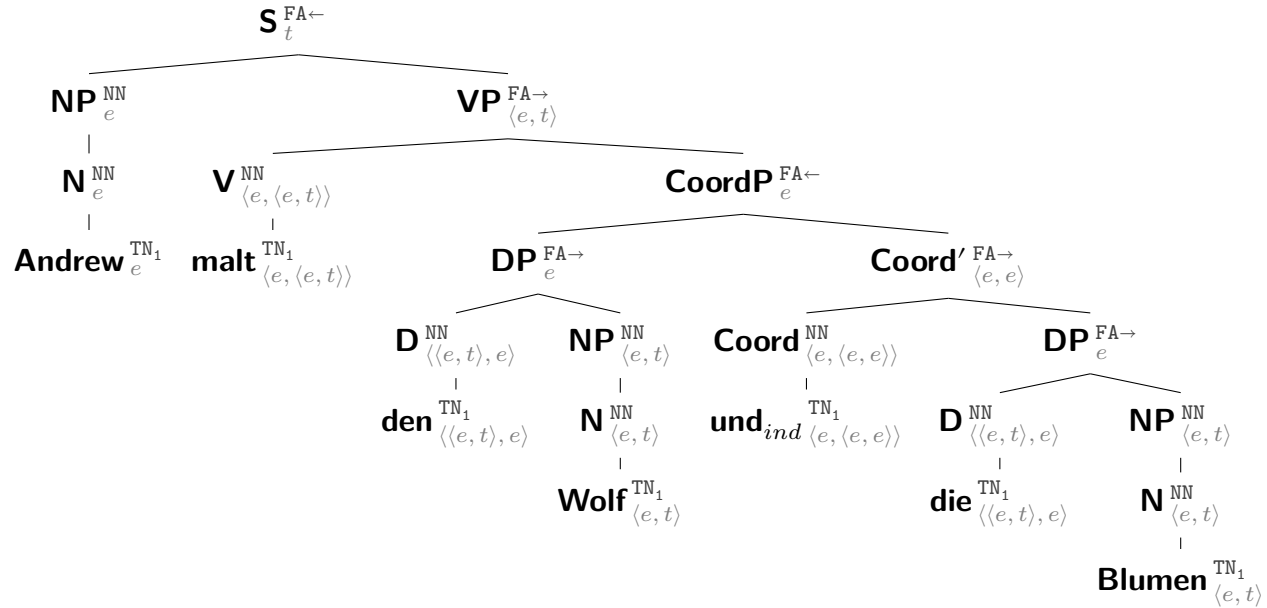
7/15 iterations, 3.05ms

```
[.\node(top){S}; [.NP [.N Andrew ] ] [.VP [.V malt ] [.\CoordP [.DP^1 [.D^1 den ] [.NP^2 [.N^2 Wolf ] ] ] [.\Coord$' $ [.\Coord und_{ind} ] [.DP^2 [.D^2 die ] [.NP^3 [.N^3 Blumen ] ] ] ] ] ]
```

a.



b.

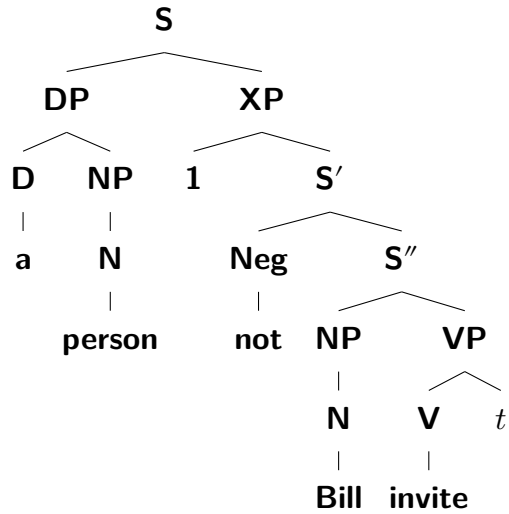


(6) A person not Bill invite.

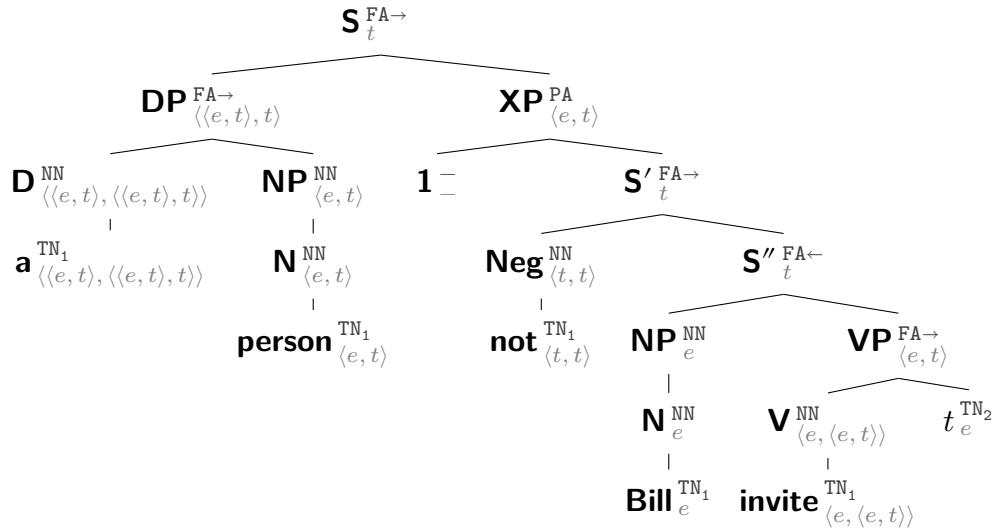
5/15 iterations, 2.20ms

```
[.\node(top){S}; [.DP [.D a ] [.NP [.N person ] ] ] [.XP [.1 ] [.S$'$ [.Neg not ] [.S$''$ [.NP^2 [.N^2 Bill ] ] [.VP [.V invite ] [.$t$ ] ] ] ] ] ]
```

a.



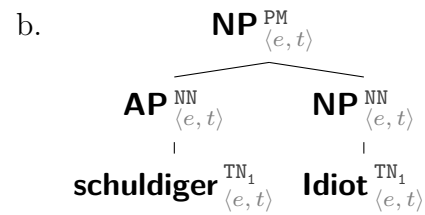
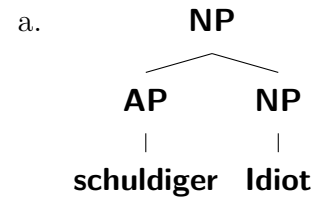
b.



(7) Schuldiger Idiot.

```
[.\node(top){NP}; [.AP schuldiger ] [.NP Idiot ] ]
```

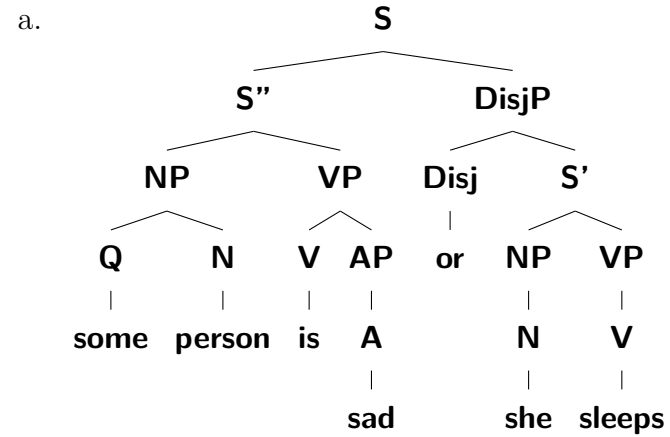
2/15 iterations, 0.60ms



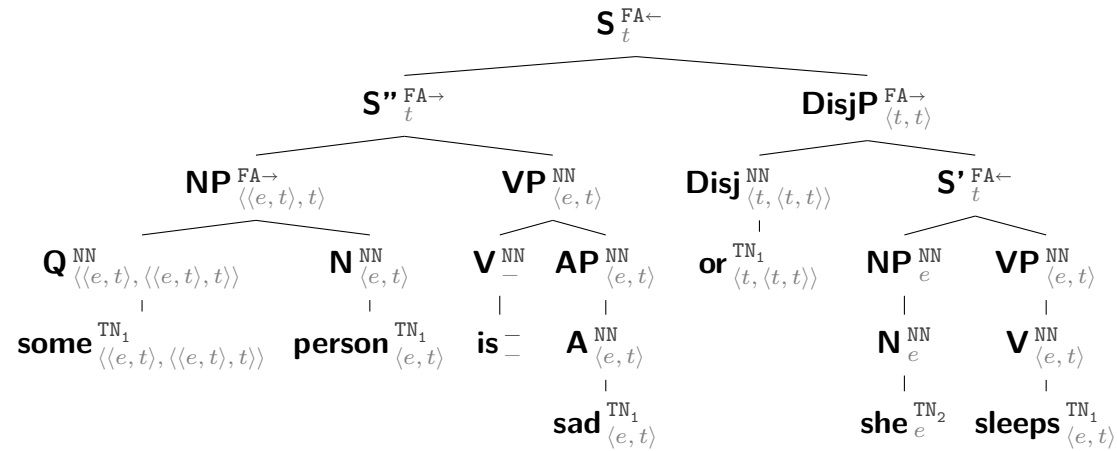
(8) Some person is sad or she sleeps.

5/15 iterations, 3.33ms

```
[.\node(top){S}; [.S'' [.NP^1 [.Q some ] [.N^1 person ] ] [.VP [.V is ] [.AP [.A sad ] ] ] ] [.DisjP [.Disj or ] [.S' [.NP^2 [.N^2 she ] ] [.VP^2 [.V^2 sleeps ] ] ] ] ] ]
```



b.

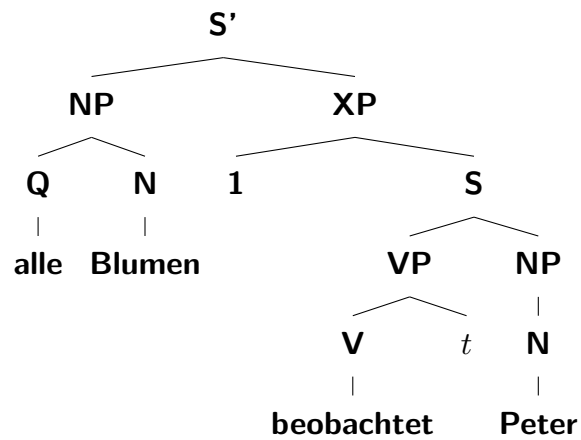


(9) Alle Blumen beobachtet Peter.

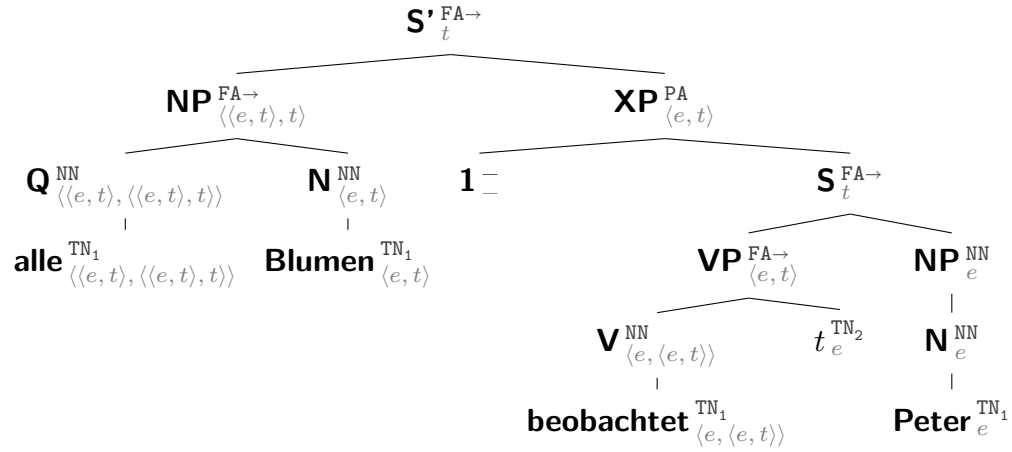
4/15 iterations, 0.90ms

```
[.\node(top){S'}; [.NP~1 [.Q alle ] [.N~1 Blumen ] ] [.XP [.1 ] [.S [.VP [.V beobachtet ] [.$t$ ] ] [.NP~2 [.N~2 Peter ] ] ] ] ]
```

a.



b.

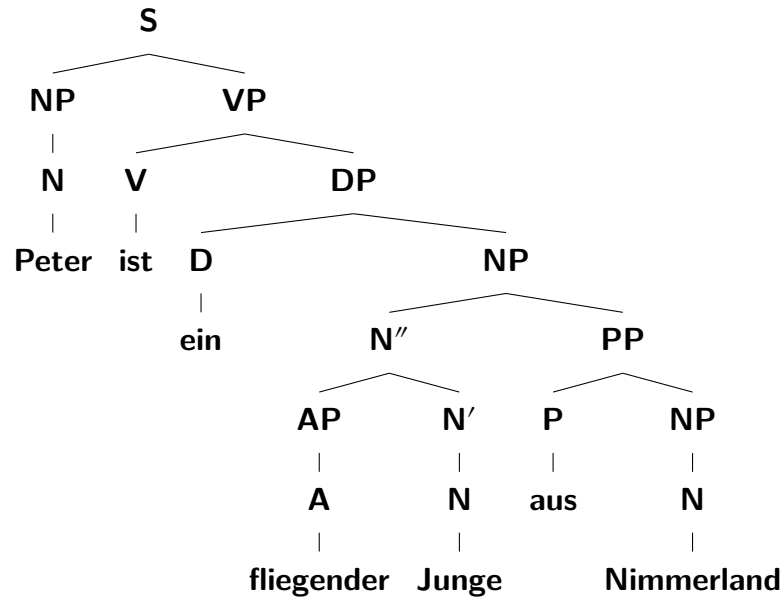


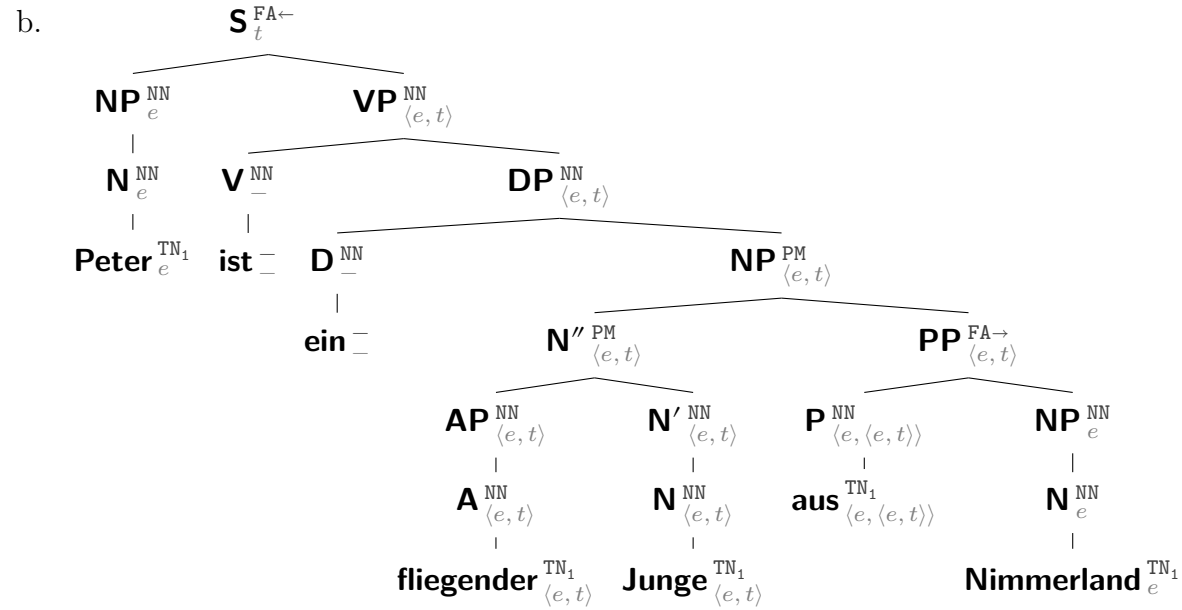
(10) Peter ist ein fliegender Junge aus Nimmerland.

6/15 iterations, 1.58ms

[.\node(top){S}; [.NP^1 [.N^1 Peter]] [.VP [.V ist] [.DP [.D ein] [.NP^2 [.N\$''\$^2 [.AP [.A fliegender]] [.N\$'\$^2 [.N^2 Junge]]] [.PP [.P aus] [.NP^3 [.N^3 Nimmerland]]]]]]]

a.

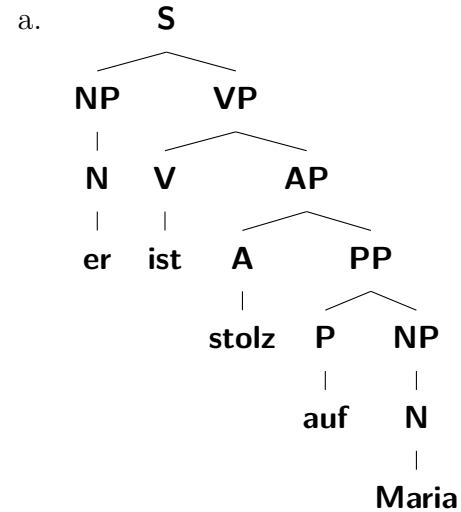


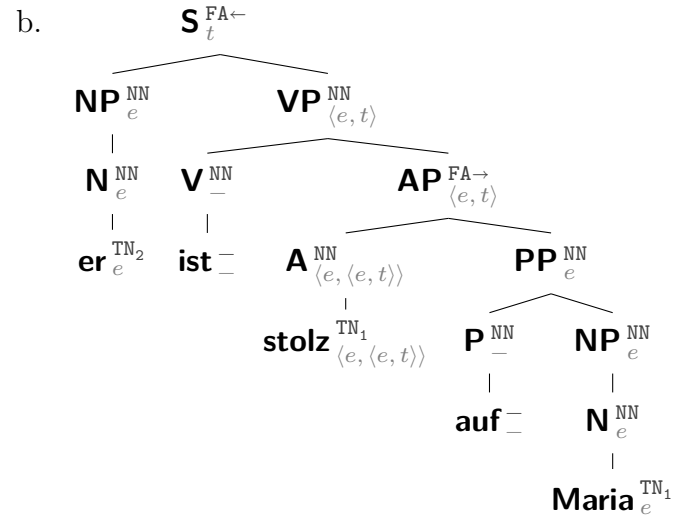


(11) Er ist stolz auf Maria.

5/15 iterations, 1.56ms

```
[.\node(top){S}; [.NP [.N er ] ] [.VP [.V ist ] [.AP [.A stolz ] [.PP [.P auf ] [.NP^2 [.N^2 Maria ] ] ] ] ] ]
```

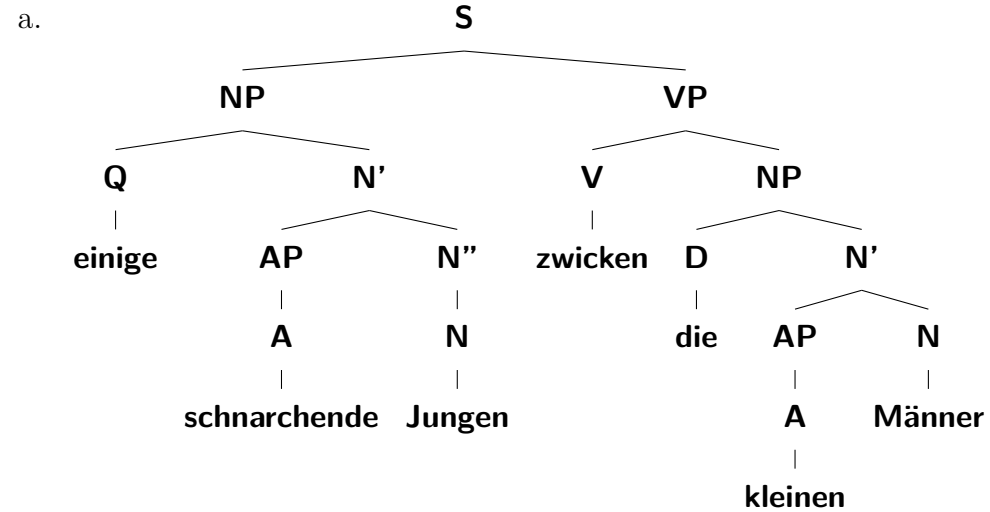




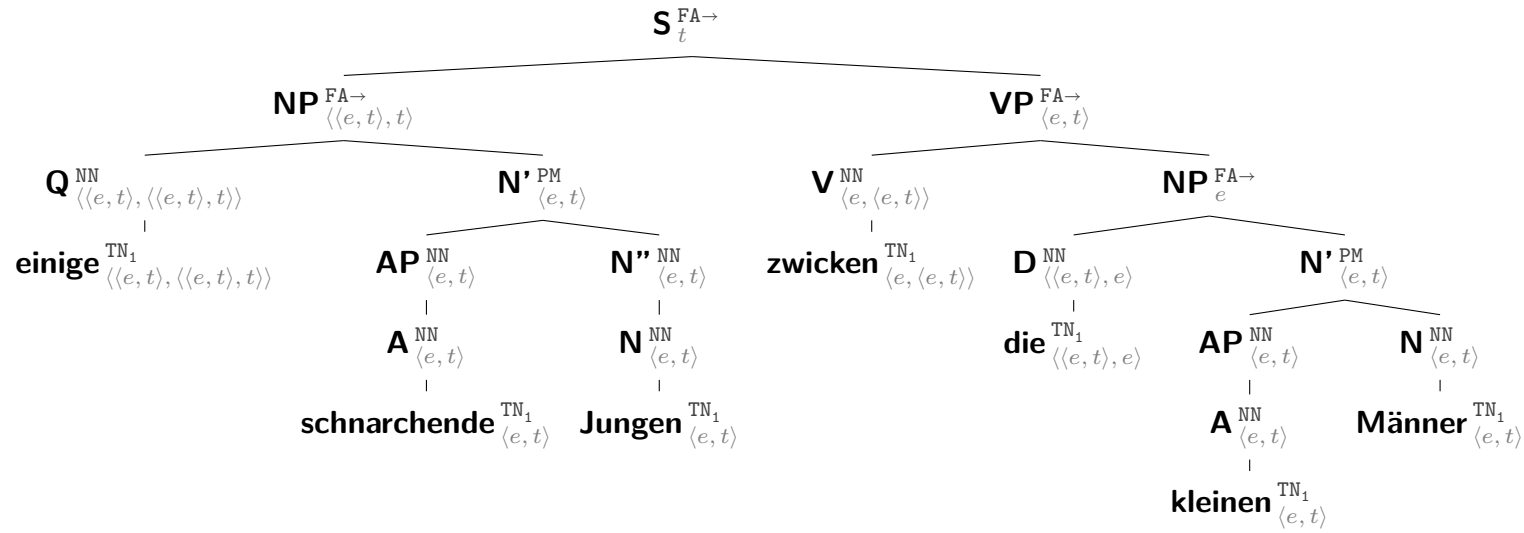
(12) Einige schnarchende Jungen zwicken die kleinen Männer.

6/15 iterations, 2.55ms

```
[.\node(top){S}; [.NP [.Q einige ] [.N' [.AP^1 [.A^1 schnarchende ] ] [.N'' [.N Jungen ] ] ] ] [.VP [.V zwicken ] [.NP^2 [.D die ] [.N'^2 [.AP^2 [.A^2 kleinen ] ] [.N^2 Männer ] ] ] ] ]
```



b.

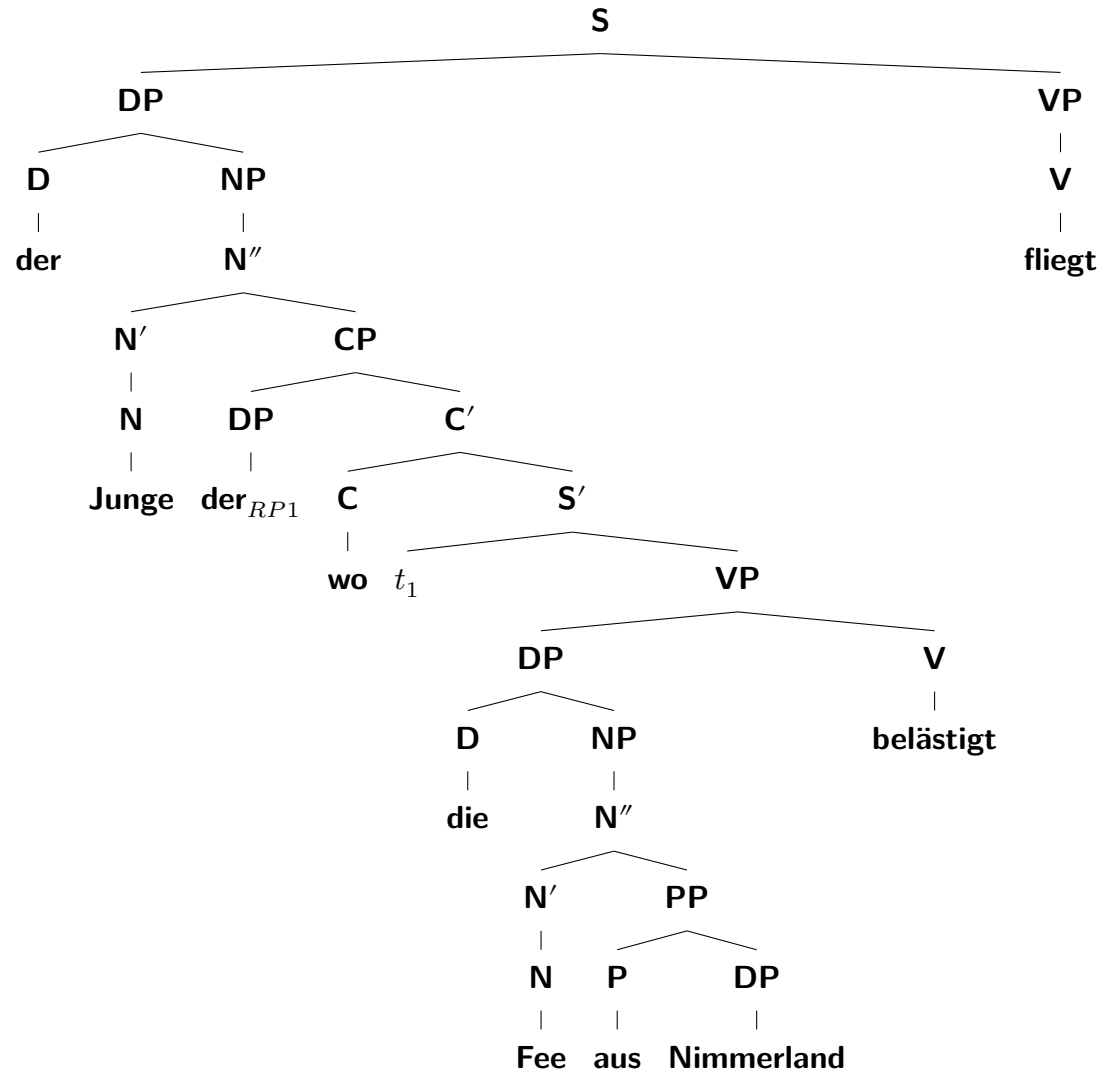


- (13) Der Junge der_{RP} wo die Fee aus Nimmerland belästigt fliegt.

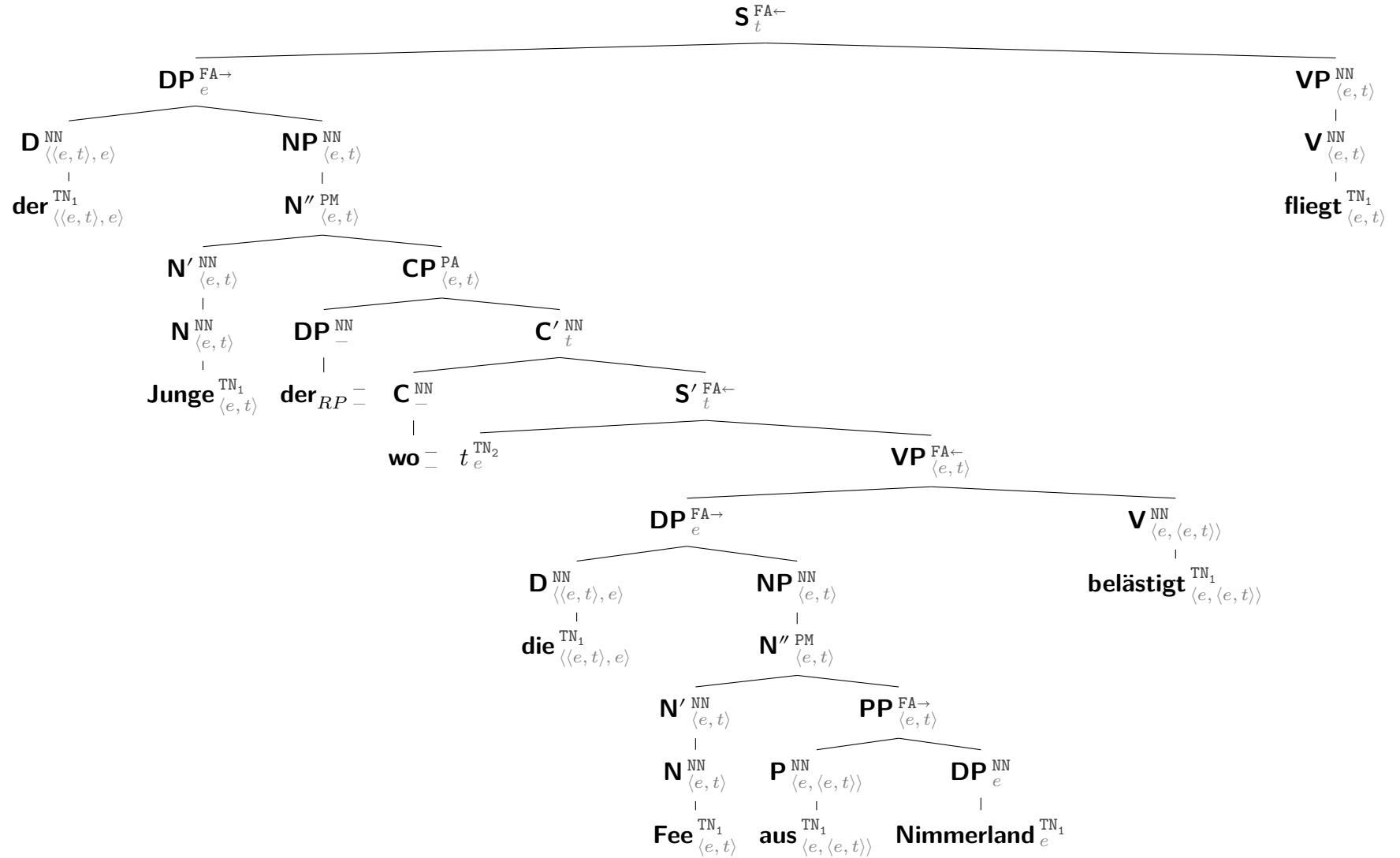
9/15 iterations, 4.69ms

[illegible]

a.



b.

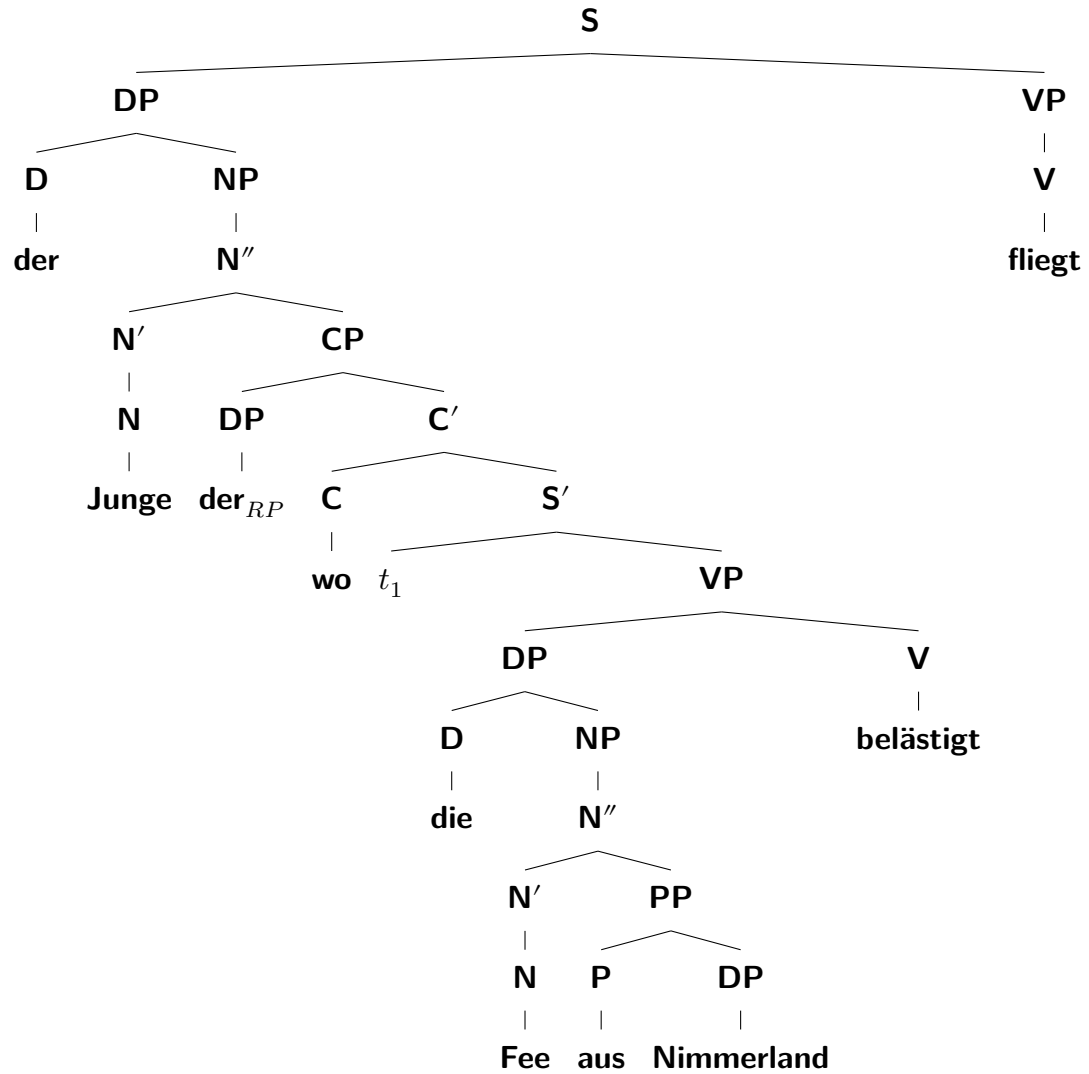


- (14) Der Junge der_{RP} wo die Fee aus Nimmerland belästigt fliegt.

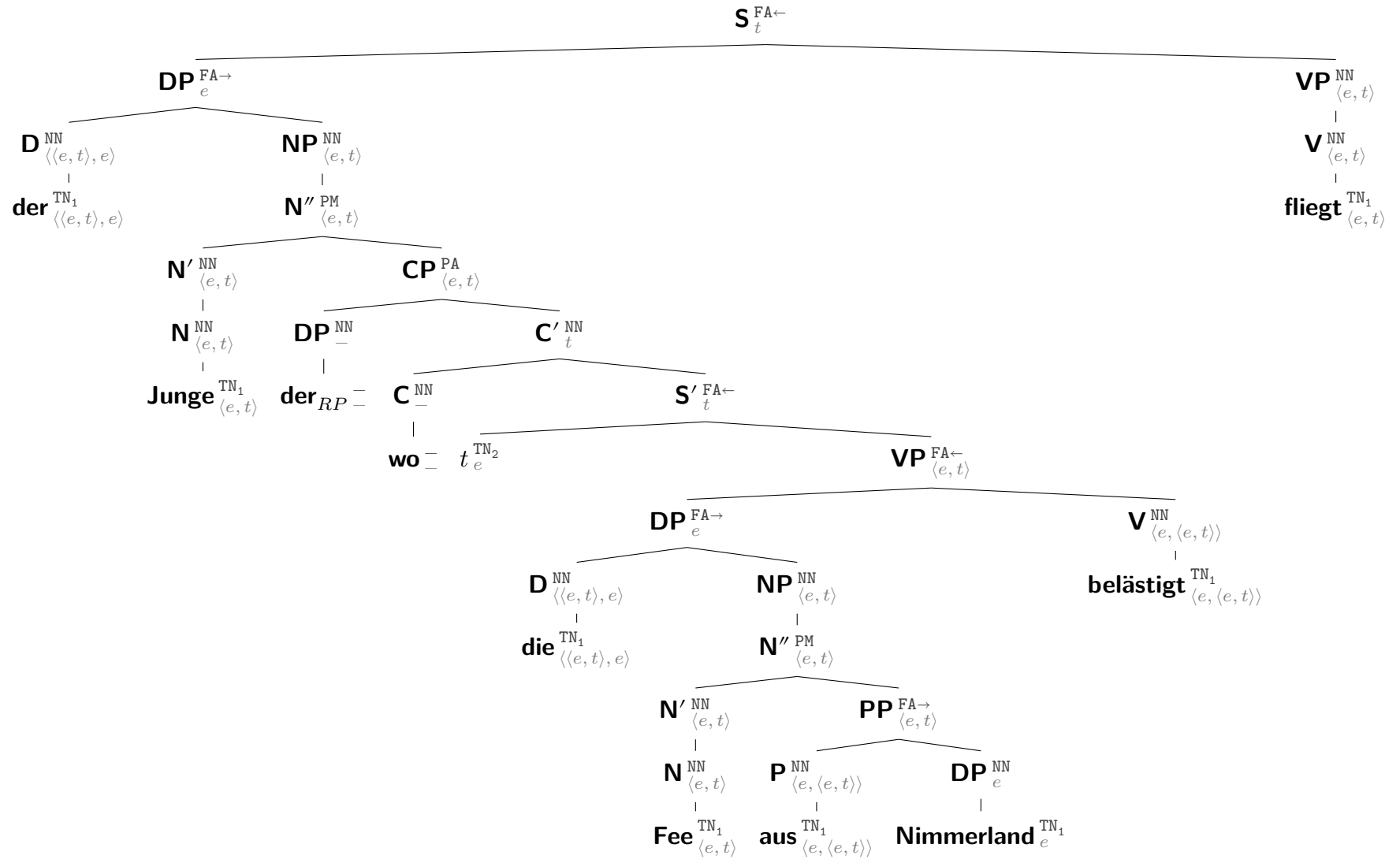
9/15 iterations, 1.38ms

[.S [.DP~1 [.D^1 der] [.NP [.N\$''\$ [.N\$'\$ [N Junge]] [.CP [.DP~2 der_{RP}] [.C\$'\$ [.C wo] [.S\$'\$ [.\$_t\$_{1}]] [.VP [.DP~3 [.D^3 die] [.NP^2 [.N\$''\$^2 [.N\$'\$^2
[N^2 Fee]] [.PP [.P aus] [.DP^4 Nimmerland]]]]] [.V belästigt]]]]]]] [.VP^2 [.V^2 fliegt]]]

a.



b.

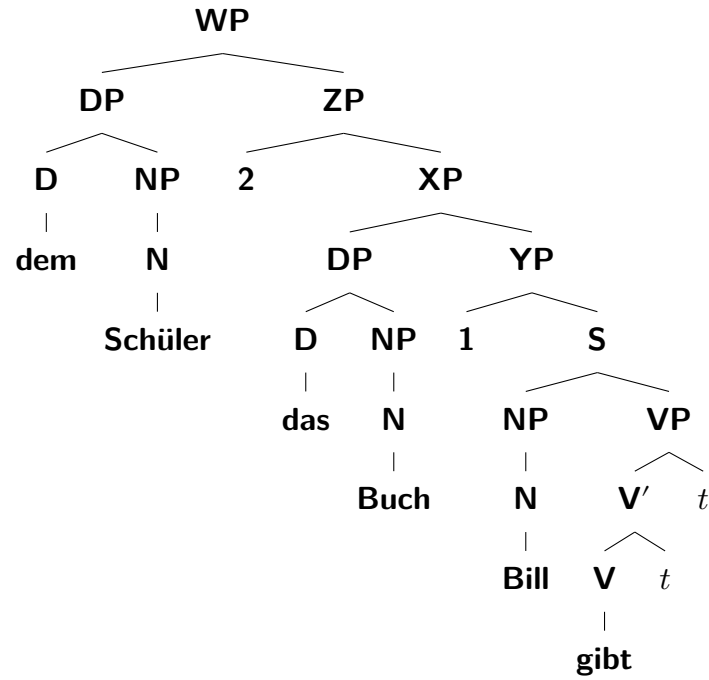


(15) Dem Schüler das Buch Bill gibt.

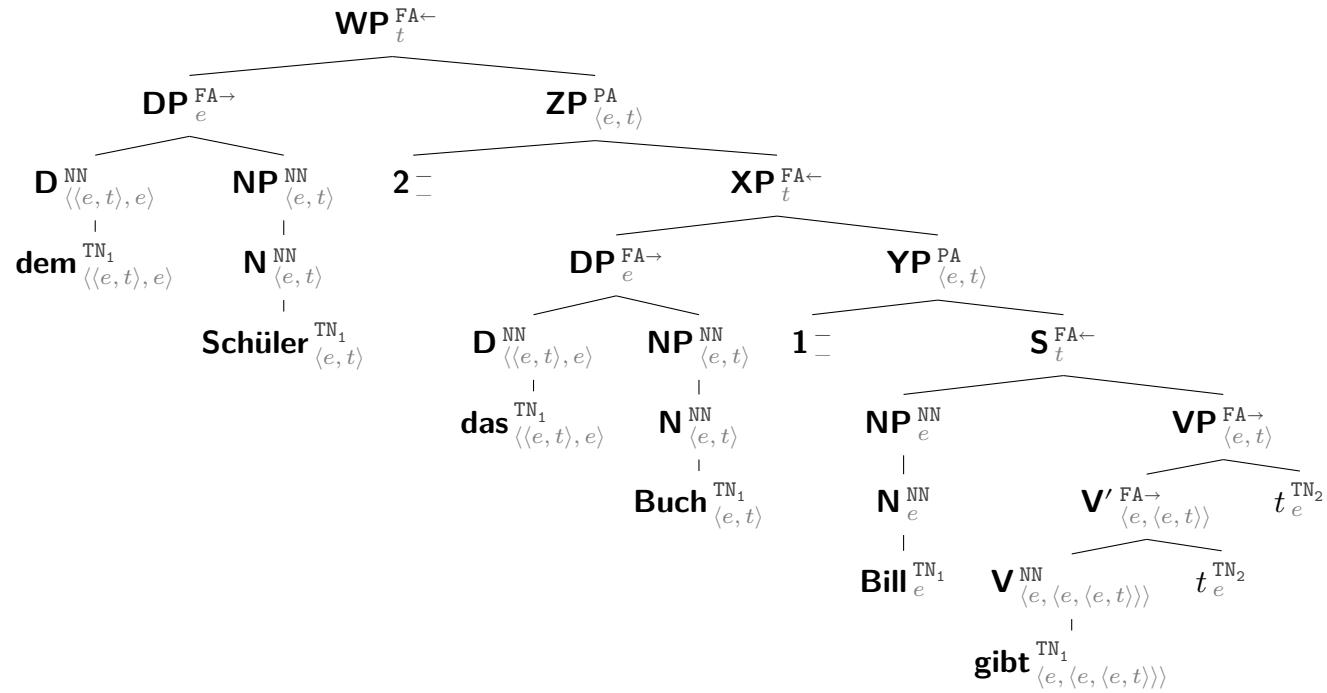
6/15 iterations, 2.55ms

[illegible]

a.



b.

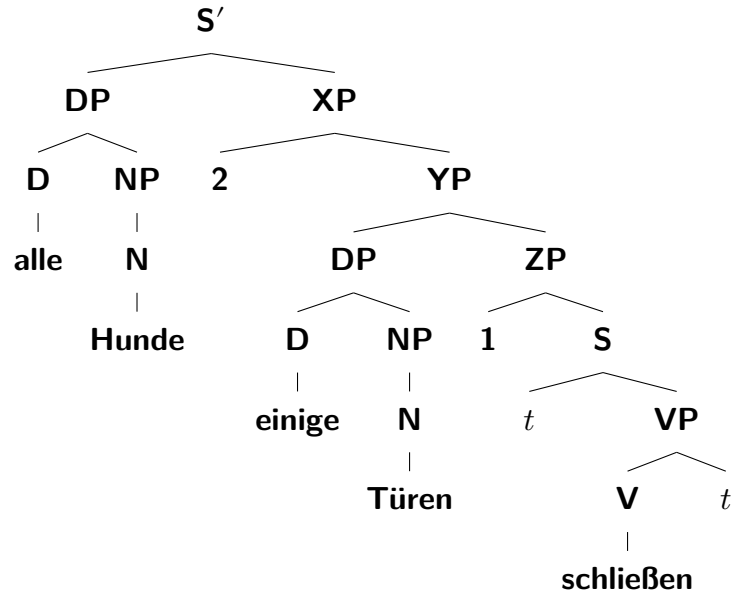


(16) Alle Hunde einige Türen schließen.

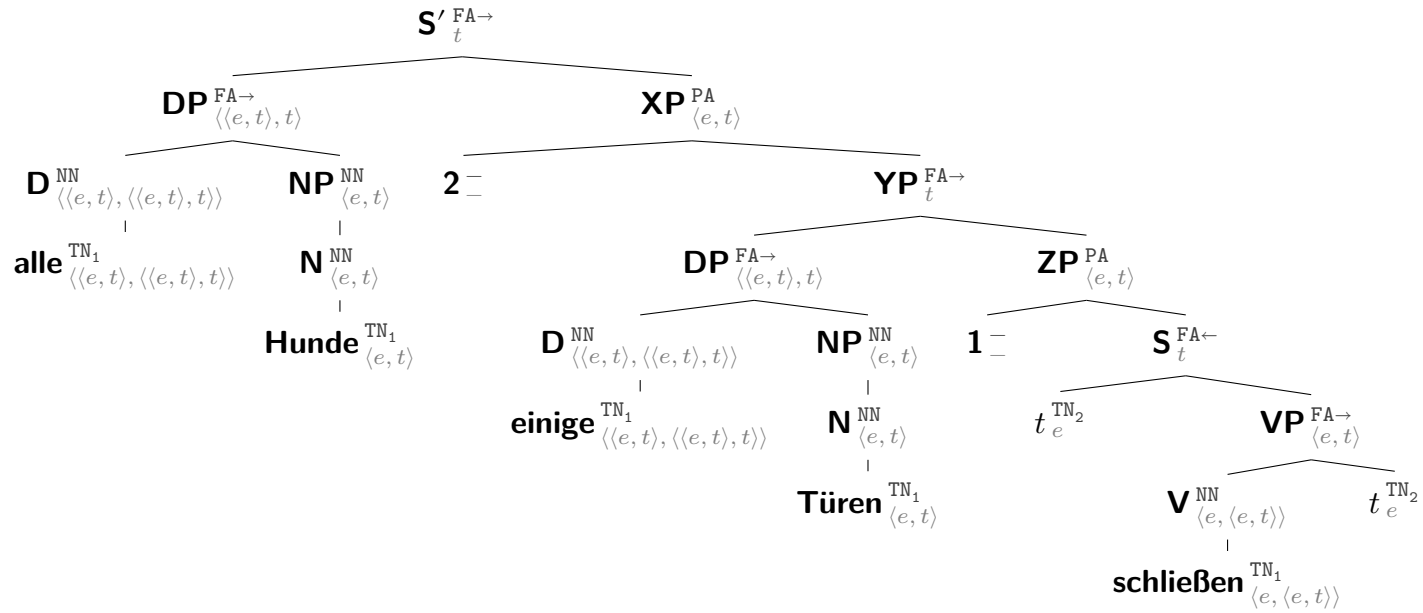
5/15 iterations, 1.81ms

```
[.\node(top){S$'$$}; [.DP^2 [.D^2 alle ] [.NP^2 [.N^2 Hunde ] ] ] [.XP [.2 ] ] [.YP [.DP^1 [.D^1 einige ] [.NP^1 [.N^1 Türen ] ] ] ] [.ZP [.1 ] ] [.S [.$t$ ] ] [.VP [.V schließen  
] [.$t$ ] ] ] ] ] ] ]
```

a.



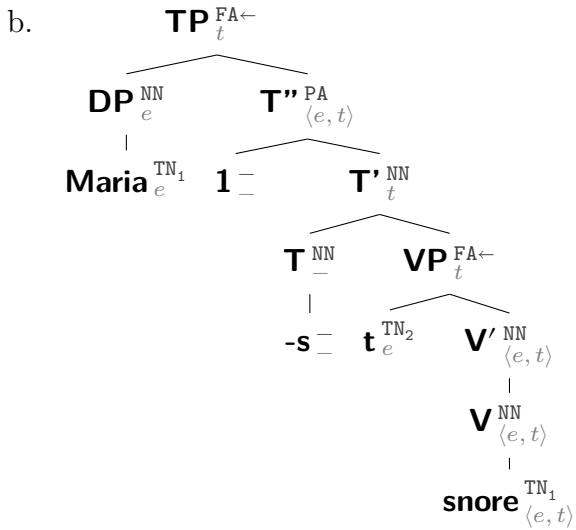
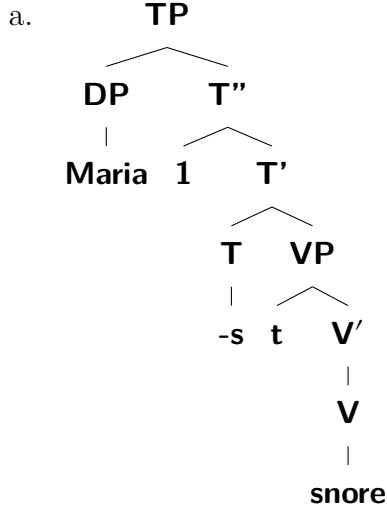
b.



(17) Maria -s snore.

5/15 iterations, 1.33ms

[.\node(top){TP}; [.DP Maria] [.T'' [.1] [.T' [.T^0 -s] [.VP [.t] [.V\$'\$ [.V^0 snore]]]]]]]

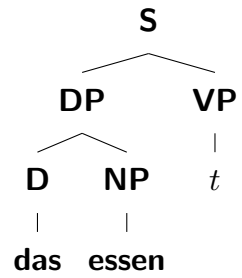


(18) Das essen *t*.

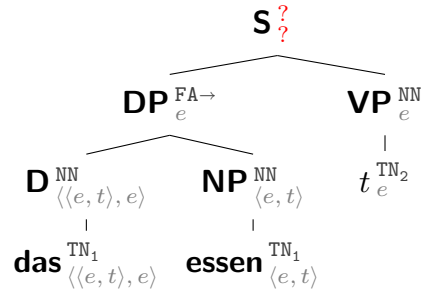
[.\node(top){S}; [.DP [.D^0 das] [.NP essen]] [.VP \$t\$]]

2/15 iterations, 0.54ms

a.



b.

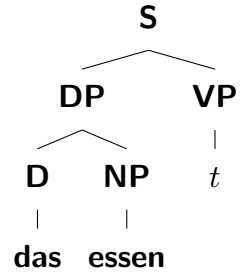


(19) Das essen t .

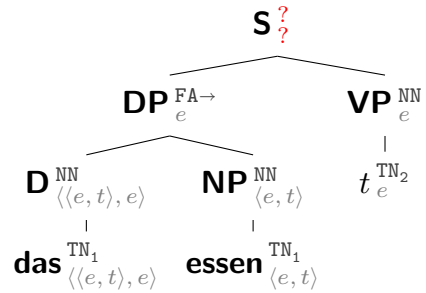
[.S [.DP [.D⁰ das] [.NP essen]] [.VP \$t\$]]

2/15 iterations, 0.21ms

a.



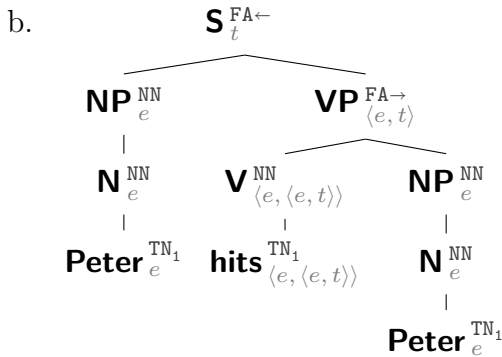
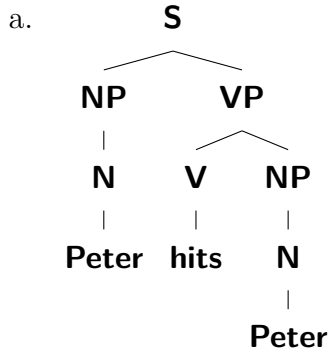
b.



(20) Peter hits Peter.

4/15 iterations, 0.27ms

[.S [.NP [.N Peter]] [.VP [.V hits] [.NP [.N Peter]]]]



(21) Alle Blumen sind stolz auf essen.

15/15 iterations, 0.82ms

[.S [.NP^1 [.Q alle] [.N^1 Blumen]] [.VP [.V sind] [.AP [.A stolz] [.PP [.P auf] [.NP^2 [.N^2 essen]]]]]]

```

graph TD
    S --> NP1[NP]
    S --> VP[VP]
    NP1 --> Q[Q]
    NP1 --> N1[N]
    Q --> alle[alle]
    N1 --> Blumen[Blumen]
    VP --> V[V]
    VP --> AP[AP]
    V --> sind[sind]
    AP --> A[A]
    AP --> PP[PP]
    A --> stolz[stolz]
    PP --> P[P]
    PP --> NP2[NP]
    P --> auf[auf]
    NP2 --> N[N]
    N --> essen[essen]

```

Diagram illustrating the semantic structure of the sentence "Alle Blumen sind stolz auf essen" (All flowers are proud to eat) using the lambda calculus notation for semantic composition.

The root node is **S** with a red question mark, branching into **NP** and **VP**.

The **NP** node branches into **Q** and **N**.

The **VP** node branches into **V** and **AP**.

The **Q** node branches into **alle** (with TN_1 annotation) and **Blumen** (with TN_1 annotation).

The **N** node branches into **Blumen** (with $\langle e, t \rangle$ annotation).

The **V** node branches into **sind** (with $-$ annotation).

The **AP** node branches into **A** and **PP**.

The **A** node branches into **stolz** (with TN_1 annotation) and **essen** (with TN_1 annotation).

The **PP** node branches into **P** and **NP**.

The **P** node branches into **auf** (with $-$ annotation).

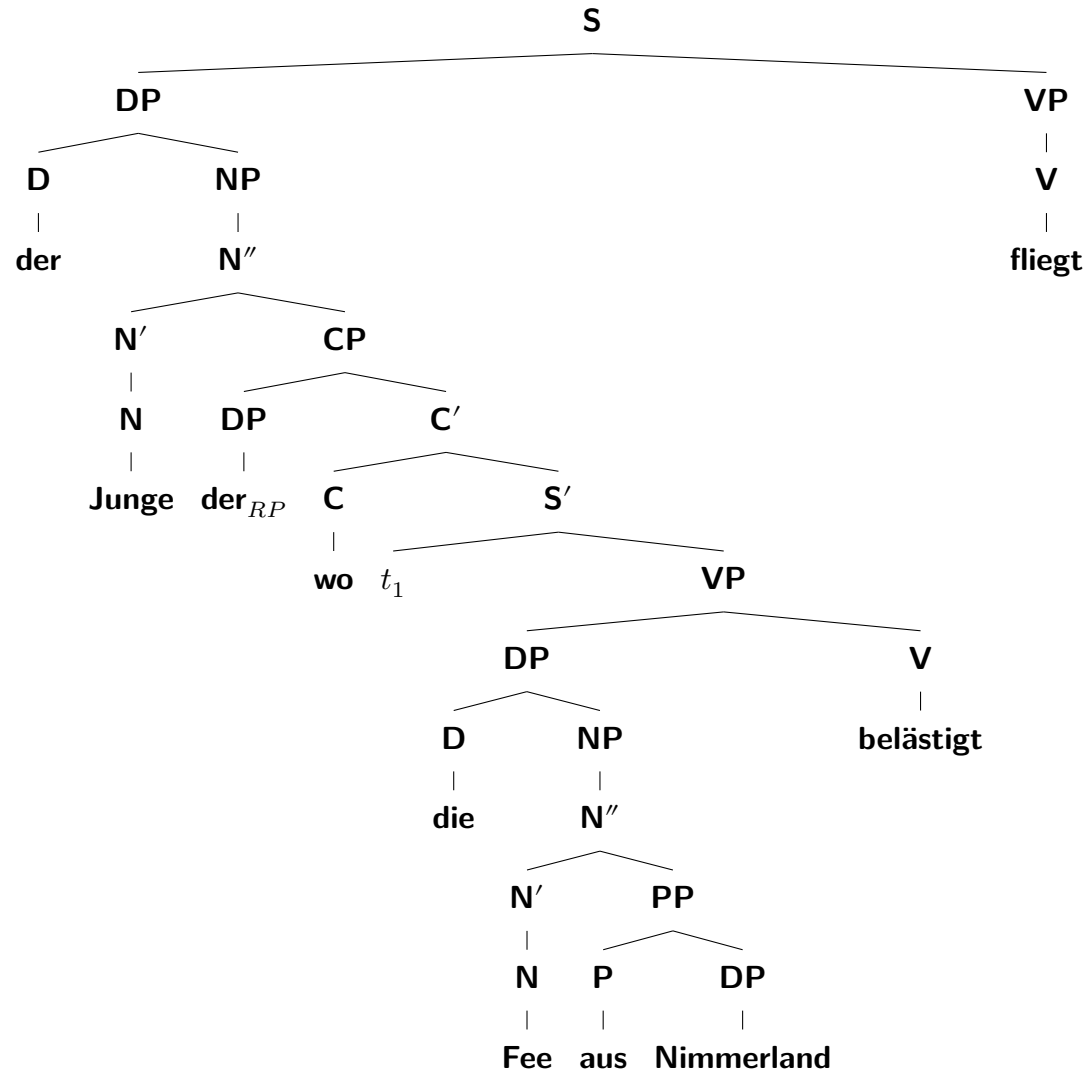
The **NP** node branches into **N** and **essen** (with TN_1 annotation).

The **N** node branches into **essen** (with $\langle e, t \rangle$ annotation).

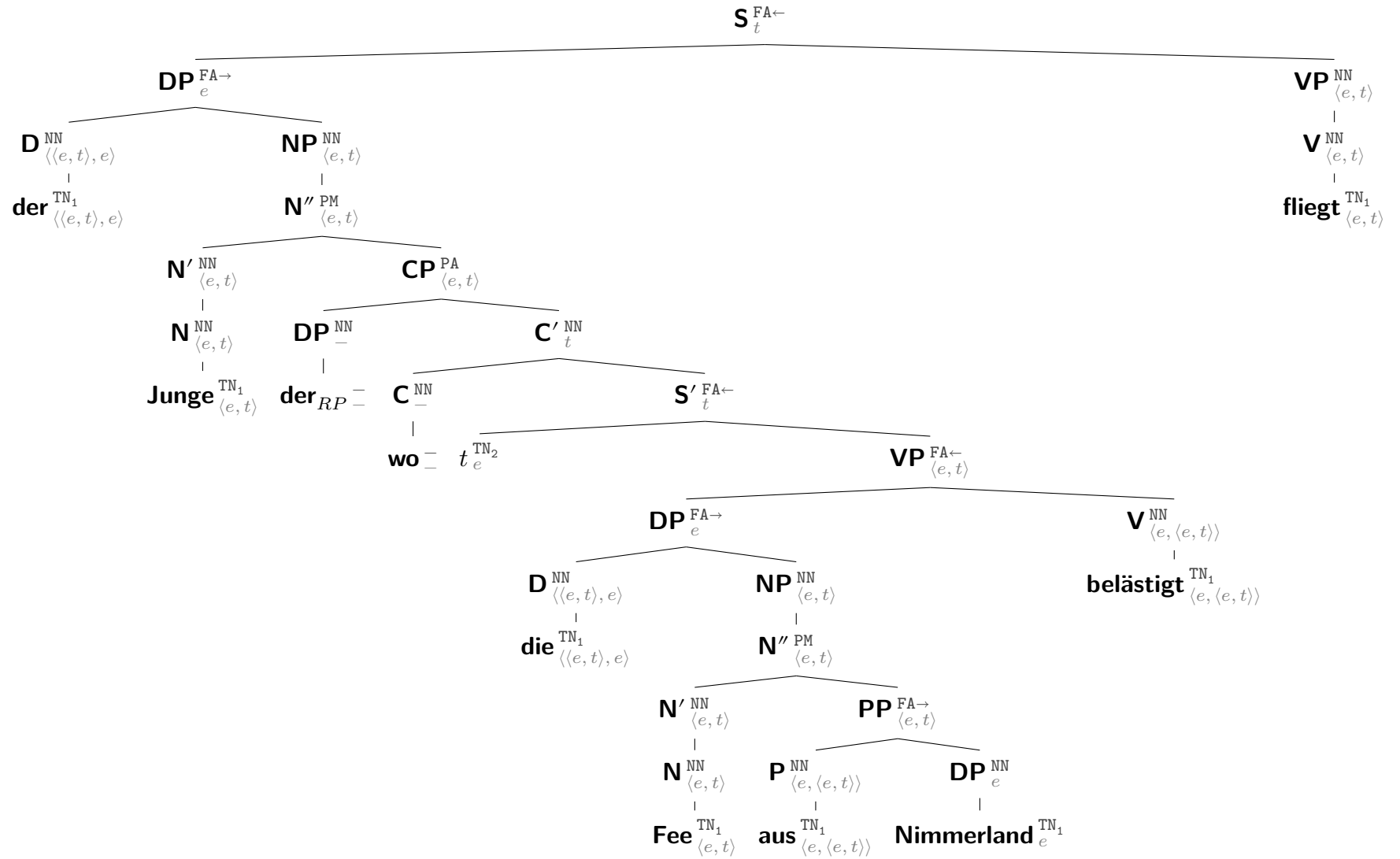
9/15 iterations, 1.32ms

[S [DP [D der] [.NP [.N\$'\$ [N\$'\$ [N Junge]] [.CP [DP der_{RP}] [.C\$'\$ [C wo] [.S\$'\$ [.t\$_1] [.VP [DP [D die] [.NP [.N\$'\$ [N\$'\$ [N Fee]] [.PP [.P aus] [.DP Nimmerland]]]]] [.V belästigt]]]]]]] [.VP [.V fliegt]]]

a.



b.



| t | e | $\langle t, t \rangle$ | Vacuous | Pronouns | $\langle e, t \rangle$ | $\langle e, \langle e, t \rangle \rangle$ | $\langle e, \langle e, e \rangle \rangle$ | $\langle e, \langle e, \langle e, t \rangle \rangle \rangle$ | $\langle t, \langle t, t \rangle \rangle$ | $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$ | $\langle \langle e, t \rangle, t \rangle$ | $\langle \langle e, t \rangle, e \rangle$ | Indices | Traces |
|--------|------------|------------------------|---------|----------|------------------------|---|---|--|---|---|---|---|-------------------|--------|
| regnet | Bill | not | is | er | mad | hits | und _{ind} | gibt | und | all | nobody | the | 1 | t |
| | Andrew | | ist | he | person | invite | | | | | | den | 2 | t |
| | Mathis | | of | his | essen | beobachtet | | | | | | der | der _{RP} | |
| | Mark | | es | she | sleeps | belästigt | | | | | | die | | |
| | Peter | | ein | | tanzt | bought | | | | | | a | | |
| | Markus | | auf | | schnarcht | ate | | | | | | dem | | |
| | Klaus | | wo | | verschüchterte | hated | | | | | | | | |
| | Twilight | | -s | | große | zwicken | | | | | | | | |
| | Rome | | sind | | schnarchende | schließen | | | | | | | | |
| | Nimmerland | | | | arbeitet | destruction | | | | | | | | |
| | Maria | | | | Hunde | malt | | | | | | | | |
| | | | | | Türen | aus | | | | | | | | |
| | | | | | snore | stolz | | | | | | | | |
| | | | | | schuldiger | | | | | | | | | |
| | | | | | Mann | | | | | | | | | |
| | | | | | Männer | | | | | | | | | |
| | | | | | kleinen | | | | | | | | | |
| | | | | | Fee | | | | | | | | | |
| | | | | | fliegt | | | | | | | | | |
| | | | | | Jungen | | | | | | | | | |
| | | | | | Schüler | | | | | | | | | |
| | | | | | Buch | | | | | | | | | |
| | | | | | Junge | | | | | | | | | |
| | | | | | Wolf | | | | | | | | | |
| | | | | | Blumen | | | | | | | | | |
| | | | | | flowers | | | | | | | | | |
| | | | | | Idiot | | | | | | | | | |
| | | | | | cat | | | | | | | | | |
| | | | | | sad | | | | | | | | | |
| | | | | | fliegender | | | | | | | | | |
| | | | | | fliegende | | | | | | | | | |