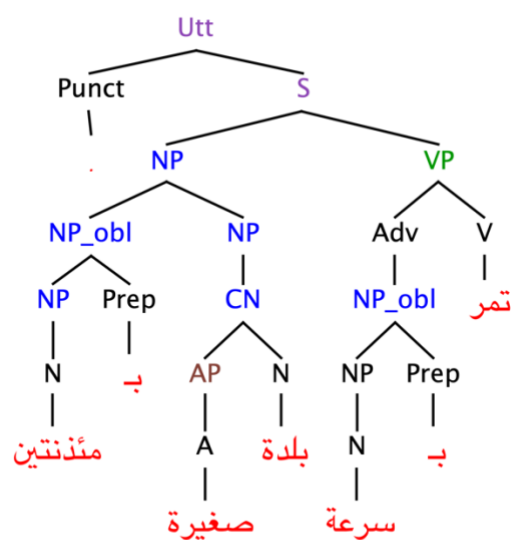
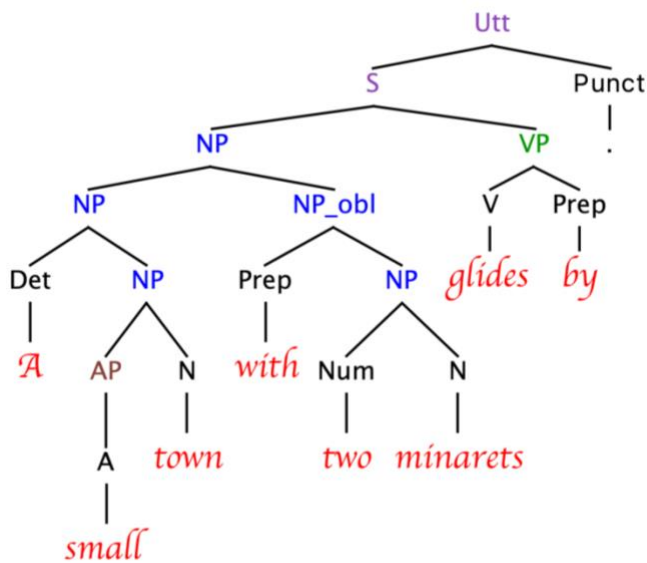
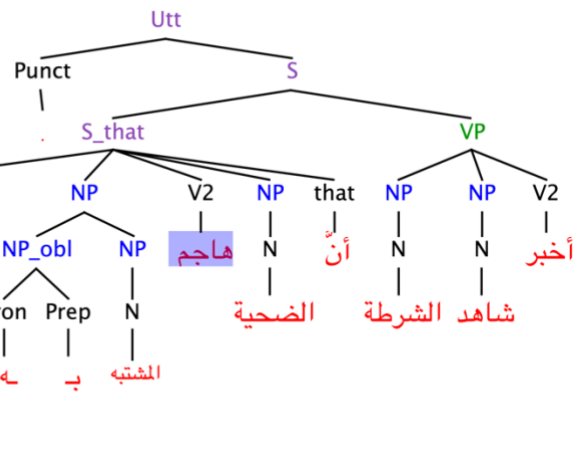
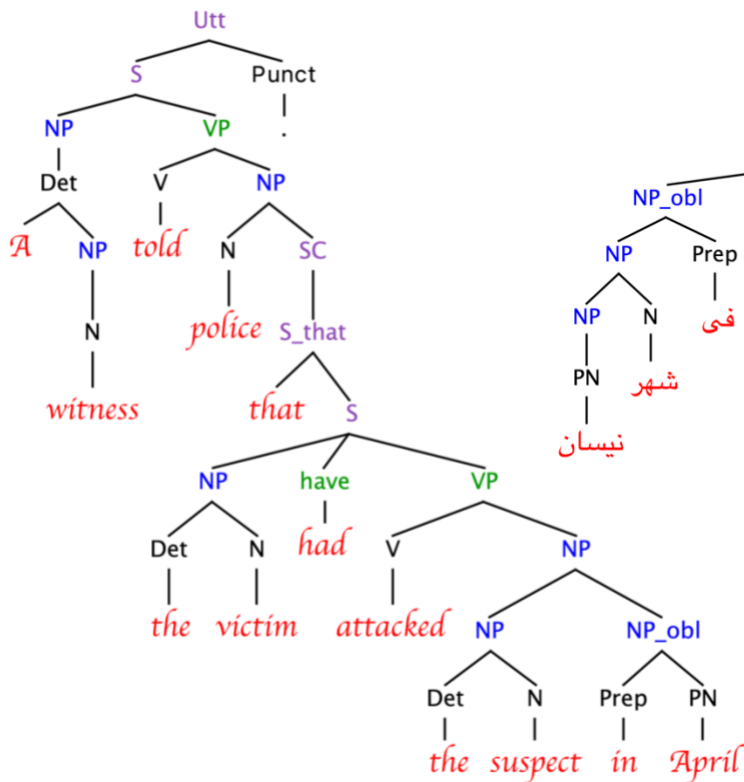


## Lab 1 – Chapter 4

- 1- Construct (by hand) phrase structure trees for some of the sentences in the corpus used in Chapter 3, both for English and your chosen language.

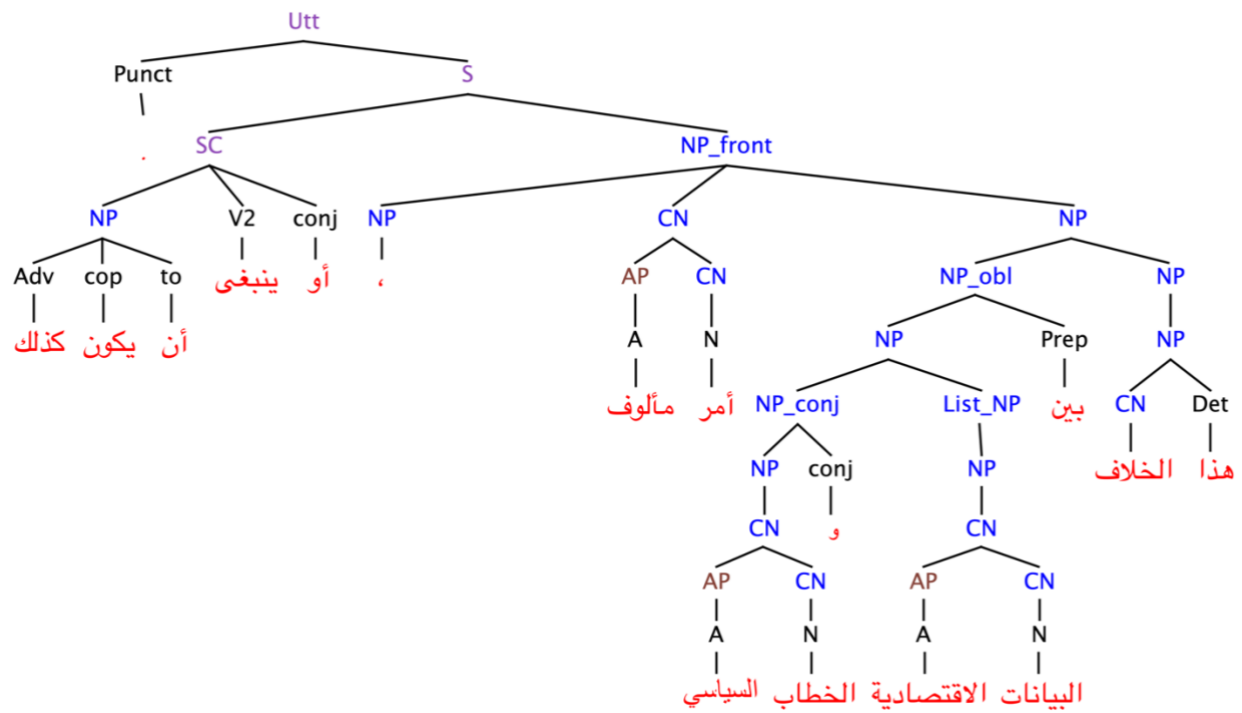
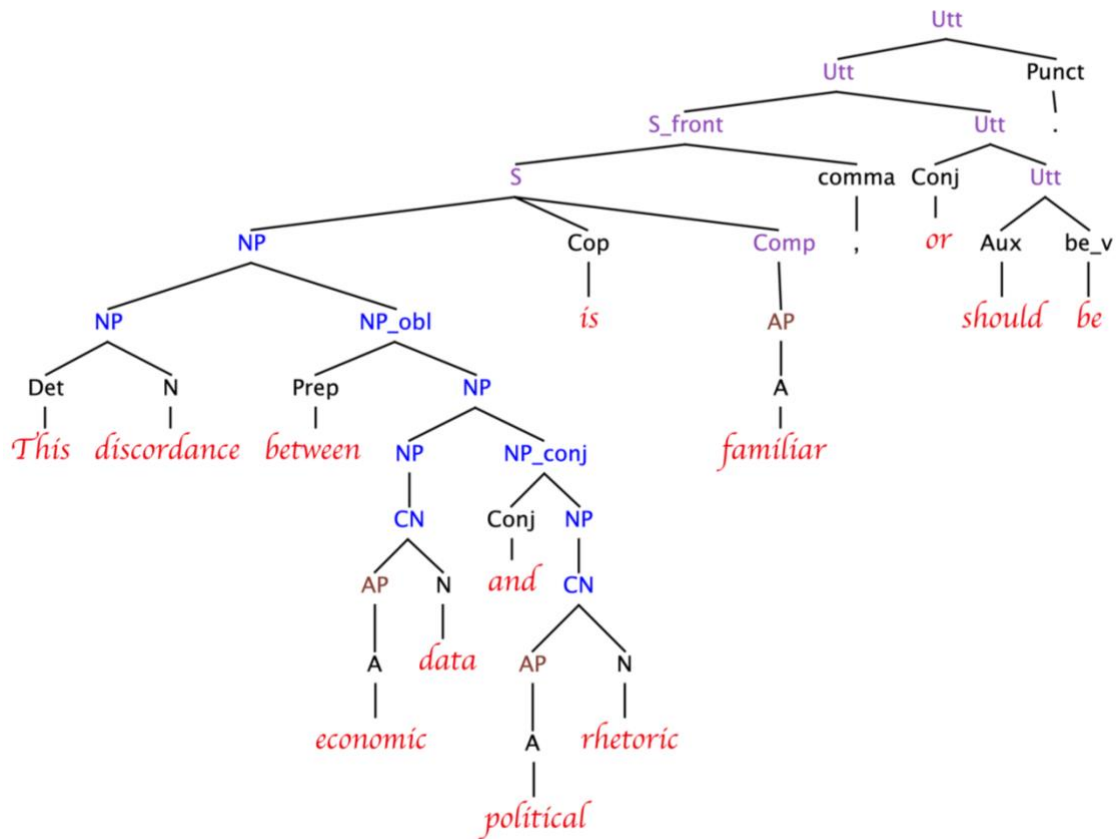


Sentence 1



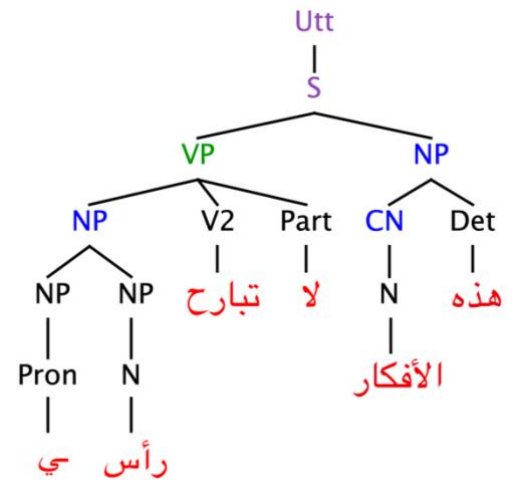
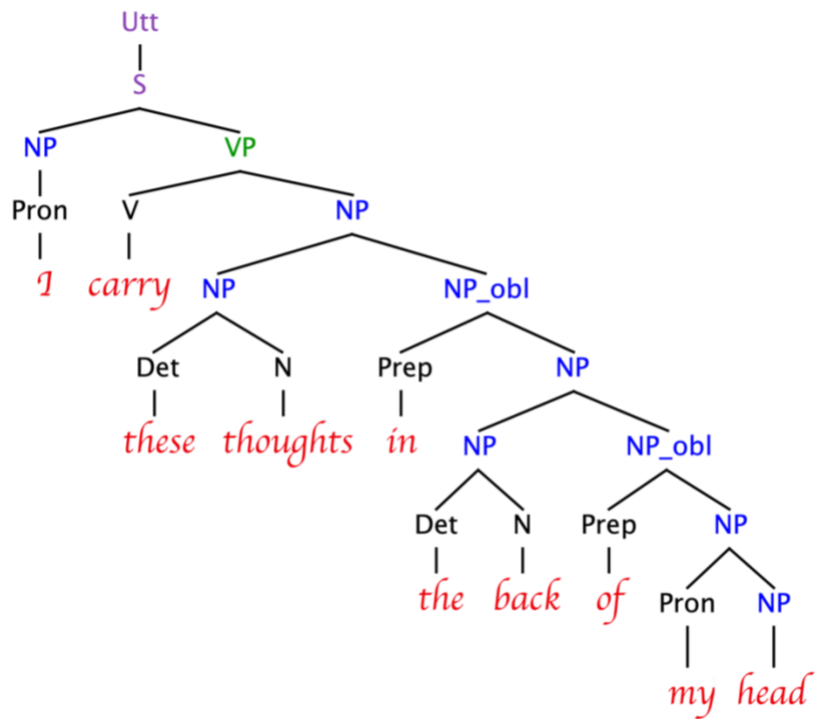
Sentence 2

## Lab 1 – Chapter 4

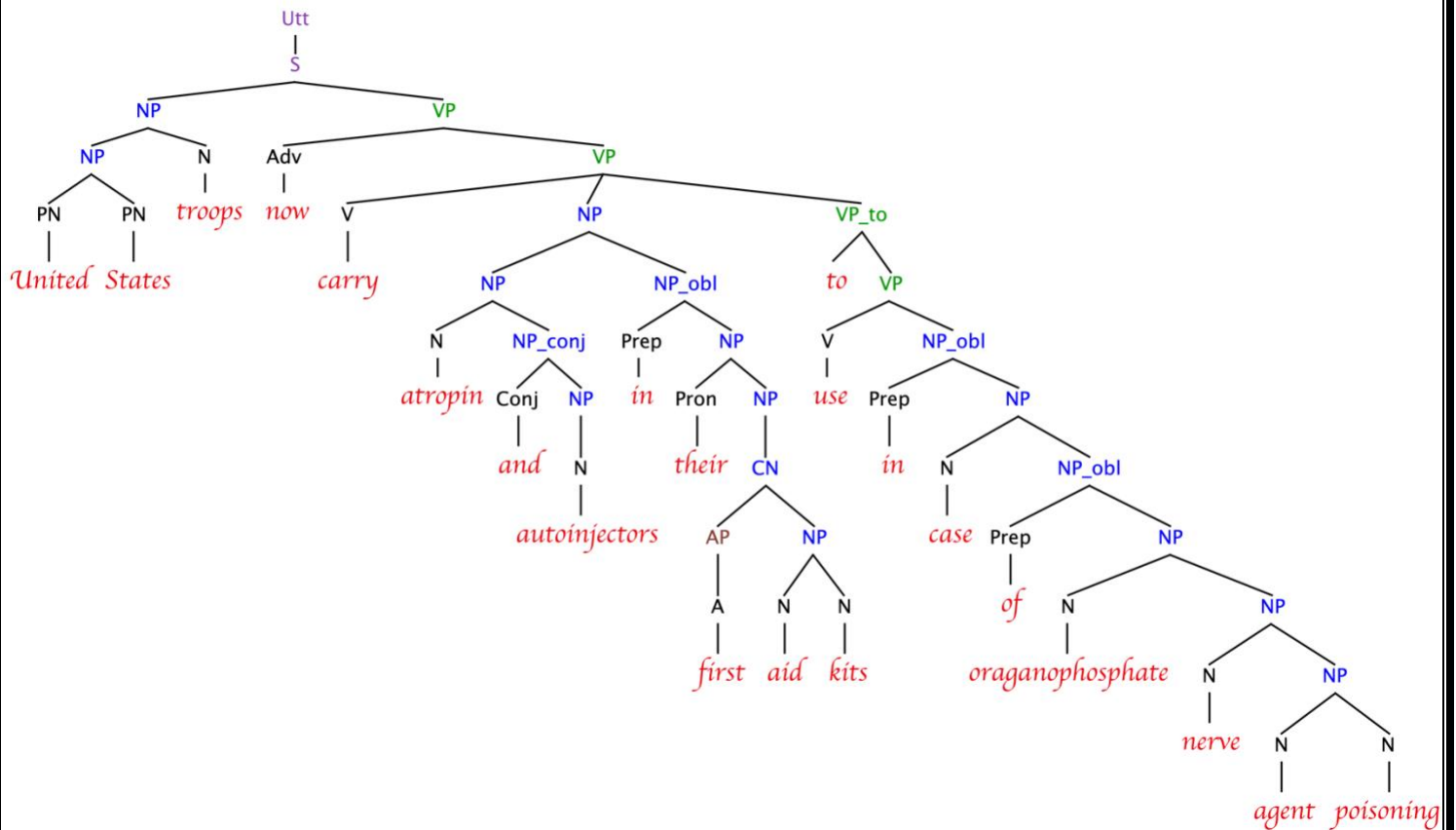


Sentence 3

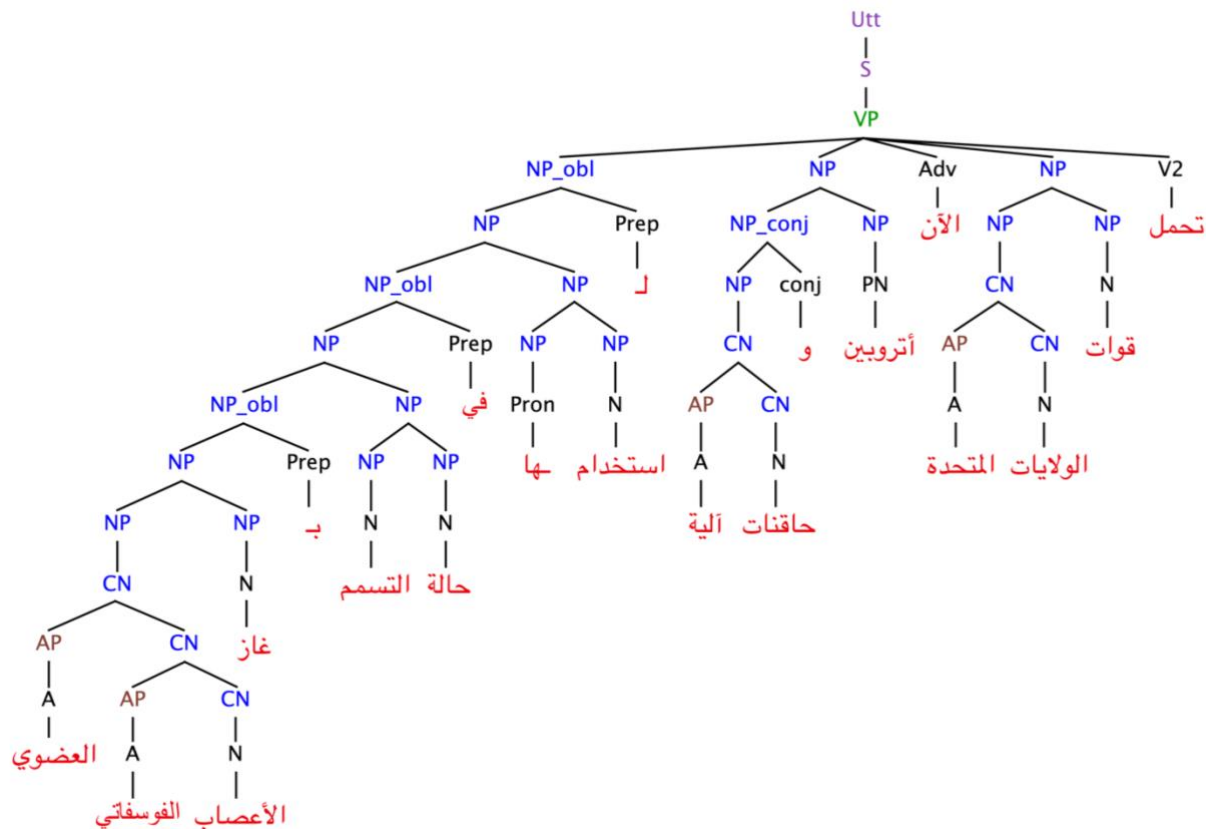
## Lab 1 – Chapter 4



Sentence 4



## Lab 1 – Chapter 4



Sentence 5

I have constructed these trees using the program TreeForm. Each tree of an English sentence is followed by (or in the opposite side of) the tree of the Arabic translation of the same sentence.

### 2- Test the grammar at:

<https://github.com/GrammaticalFramework/gf-ud/blob/master/grammars/English.dbnf>

on last week's corpus, both for English and your own language. In practice, this means:

- running gf-ud's dbnf command on (possibly POS-tagged) versions of the sentences in Chapter 3's corpus.
- comparing the CoNNL-U and parse trees obtained in this way with, respectively, your hand-drawn parse trees and the CoNNL-U trees from Chapter 3. Parse tree comparison can be qualitative, while CoNNL-U trees are to be compared quantitatively via gf-ud eval.

Using the following commands, I created two files which contain conllu trees parsed by the grammar file passed by the commands both the given English.dbnf and the manually written grammar in the Arabic.dbnf file which I wrote for the third task of the assignment.

Sarab Youssef  
Computational Syntax

## Lab 1 – Chapter 4

```
$ cat full_conllu_en.conllu | gfud extract-pos-words | gfud dbnf English.dbnf -  
cut=10 -show=1 >generated_en_conllu.conllu
```

```
$ cat full_conllu_ar.conllu | gfud extract-pos-words | gfud dbnf Arabic.dbnf -  
cut=10 -show=1 >generated_ar_conllu.conllu
```

The English.dbnf file failed to generate even a half accuracy conllu tree file with around only 42.54% accuracy for the Arabic sentences and this was evaluated with the gf-ud eval command when passing two parameters first the conllu file we created in chapter 3 of this lab and the other was the file generated from the commands above. The commands used for the evaluation are the following:

```
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro LAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
evaluating micro LAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
UDScore {udScore = 0.6795580110497238, udMatching = 17, udTotalLength = 181, udSamesLength = 123, udPerfectMatch = 1}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro UAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
evaluating micro UAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
UDScore {udScore = 0.7569060773480663, udMatching = 17, udTotalLength = 181, udSamesLength = 137, udPerfectMatch = 3}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro UAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
evaluating macro UAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
UDScore {udScore = 0.7659557858519797, udMatching = 17, udTotalLength = 181, udSamesLength = 137, udPerfectMatch = 3}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro LAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
evaluating macro LAS full_conllu_ar.conllu generated_ar_test_conllu.conllu  
UDScore {udScore = 0.6901288110198145, udMatching = 17, udTotalLength = 181, udSamesLength = 123, udPerfectMatch = 1}
```

```
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro LAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating micro LAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.6441176470588236, udMatching = 24, udTotalLength = 340, udSamesLength = 219, udPerfectMatch = 3}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro UAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating micro UAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.7029411764705882, udMatching = 24, udTotalLength = 340, udSamesLength = 239, udPerfectMatch = 4}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro UAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating macro UAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.7378607905781817, udMatching = 24, udTotalLength = 340, udSamesLength = 239, udPerfectMatch = 4}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro LAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating macro LAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.6742584609432436, udMatching = 24, udTotalLength = 340, udSamesLength = 219, udPerfectMatch = 3}
```

I tried to construct the Arabic trees for the chosen sentences above using the command:

```
$ echo "<VERB> ب:<ADP> سرعة:<NOUN> بلدة:<NOUN> صغيرة:<ADJ>  
<ADJ> بمئذنتين:<PUNCT>." | gfud dbnf Arabic.dbnf Utt | gfud parse2latex  
parsetree11
```

But the dot file was not created successfully because there is a problem with the Arabic characters as mentioned before in the previous labs that's why I was not able to visually construct the trees, generated with the help of the dbnf grammar file, as I did with the English ones, but I can say that not all have followed the same path I expected them too, not in the parse tree, although the dependency tree would look exactly the same but the phrase structure tree is somehow different.

I actually had to edit the English.dbnf file for the first sentence: "Who are they?" as it is a question and the way it was parsed was a complete failure by considering "they" as the root instead of "Who". There were other mistakes I tried to solve in another dbnf file and managed to do so but I didn't use it later.



## Lab 1 – Chapter 4

In the English version the constructed trees were not always a success and there was some confusion as well

### **3- Modify the grammar to suit your language and test it on some of the UD treebanks by using gf-ud eval. Try to obtain a udScore above 0.60. You are welcome to explain the changes you make.**

I only took the essential grammar that might be helpful in Arabic but constructed all the other sentences and noun/verb/adj phrases from scratch based on the sentence given in chapter 3.

I ran into some challenges when I want the dependency to be nmod I get obl or the other way around, same applies to obj/nmod and there was a special case where a noun is preceded by an adjective and followed by another adjective, this was tricky to implement and to wrap my head around it.

There is a major change that I implemented in the grammar as Arabic considered a VSO language, so we would often run into sentences that start with VP instead of NP as we were used to and that's why sometimes when we have two nouns preceded by a verb our grammar would get confused whether the second noun is an object or nmod. I still have a problem with how to know if the noun after an adposition is then obl or nmod and I still need to practice it more.

The Arabic.dbnf file is also uploaded to the repository on GitHub.

As for the udScore as we can see in the previous photo, I got a udScore higher than 65% which for all the micro/macro LAS/UAS evaluation metrics.

There is something I have noticed something when I tried to evaluate another conllu file which I created using this command:

```
$ cat full_conllu_ar.conllu | gfud extract-pos-words | gfud dbnf Arabic.dbnf Utt -  
cut=10 -show=1 >generated_ar_conllu.conllu
```

```
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro LAS full_conllu_ar.conllu generated_ar_conllu.conllu  
evaluating micro LAS full_conllu_ar.conllu generated_ar_conllu.conllu  
UDScore {udScore = 0.7016574585635359, udMatching = 17, udTotalLength = 181, udSamesLength = 127, udPerfectMatch = 2}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro UAS full_conllu_ar.conllu generated_ar_conllu.conllu  
evaluating micro UAS full_conllu_ar.conllu generated_ar_conllu.conllu  
UDScore {udScore = 0.7955801104972375, udMatching = 17, udTotalLength = 181, udSamesLength = 144, udPerfectMatch = 4}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro UAS full_conllu_ar.conllu generated_ar_conllu.conllu  
evaluating macro UAS full_conllu_ar.conllu generated_ar_conllu.conllu  
UDScore {udScore = 0.8049964020984783, udMatching = 17, udTotalLength = 181, udSamesLength = 144, udPerfectMatch = 4}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro LAS full_conllu_ar.conllu generated_ar_conllu.conllu  
evaluating macro LAS full_conllu_ar.conllu generated_ar_conllu.conllu  
UDScore {udScore = 0.7152805383774242, udMatching = 17, udTotalLength = 181, udSamesLength = 127, udPerfectMatch = 2}
```

## Lab 1 – Chapter 4

```
$ cat full_conllu_en.conllu | gfud extract-pos-words | gfud dbnf English.dbnf Utt -  
cut=10 -show=1 >generated_en_conllu.conllu
```

```
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro LAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating micro LAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.6794117647058824, udMatching = 24, udTotalLength = 340, udSamesLength = 231, udPerfectMatch = 3}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro UAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating micro UAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.7382352941176471, udMatching = 24, udTotalLength = 340, udSamesLength = 251, udPerfectMatch = 6}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro UAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating macro UAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.7544342634016545, udMatching = 24, udTotalLength = 340, udSamesLength = 251, udPerfectMatch = 6}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro LAS full_conllu_en.conllu generated_en_conllu.conllu  
evaluating macro LAS full_conllu_en.conllu generated_en_conllu.conllu  
UDScore {udScore = 0.6924853729201556, udMatching = 24, udTotalLength = 340, udSamesLength = 231, udPerfectMatch = 3}
```

In this command you can see that I added next to the grammar file Utt as an argument, and the result was another conllu file which I compared to the original conllu file but actually had a very good udScore which was even better than the first udScores gotten without using this argument. I would very much like to know why, although in the lecture we don't use this argument, how could these two commands be so different? And how do they work exactly? I noticed that the trees in the first case start with chunks instead of Utt and I appreciate a more detailed explanation.

I would also like to know what the difference is between cutting at 100 parses or 10 parses, how does one of the parses get selected? And how does it affect the results we are getting when creating the conllu file? For Arabic, they both gave the same udScores, so it was not worth mentioning nor comparing, whereas the English files were somehow different and that's when I got confused because the udScore decreased by increasing the number of parses as if there was a high possibility to get worse parses and then pick one of them and instead of the best one.

```
$ cat full_conllu_en.conllu | gfud extract-pos-words | gfud dbnf English.dbnf Utt -  
cut=100 -show=1 >generated_en_test_conllu.conllu
```

```
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro LAS full_conllu_en.conllu generated_en_test_conllu.conllu  
evaluating micro LAS full_conllu_en.conllu generated_en_test_conllu.conllu  
UDScore {udScore = 0.6764705882352942, udMatching = 24, udTotalLength = 340, udSamesLength = 230, udPerfectMatch = 3}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval micro UAS full_conllu_en.conllu generated_en_test_conllu.conllu  
evaluating micro UAS full_conllu_en.conllu generated_en_test_conllu.conllu  
UDScore {udScore = 0.7352941176470589, udMatching = 24, udTotalLength = 340, udSamesLength = 250, udPerfectMatch = 6}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro UAS full_conllu_en.conllu generated_en_test_conllu.conllu  
evaluating macro UAS full_conllu_en.conllu generated_en_test_conllu.conllu  
UDScore {udScore = 0.7478866443540354, udMatching = 24, udTotalLength = 340, udSamesLength = 250, udPerfectMatch = 6}  
[gussarayo@GU.GU.SE@eduserv Computational_Syntax]$ gfud eval macro LAS full_conllu_en.conllu generated_en_test_conllu.conllu  
evaluating macro LAS full_conllu_en.conllu generated_en_test_conllu.conllu  
UDScore {udScore = 0.686166691601474, udMatching = 24, udTotalLength = 340, udSamesLength = 230, udPerfectMatch = 3}
```