

# Symbolic Programming - Chapter 7 - Definite Clause Grammars

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These notes follow the online coursebook [Learn Prolog Now](#).

**Context-Free Grammars** DCGs are a special notation for defining grammars.

CFGs are a finite collection of rules which tell us that certain sentences are correct and what their structure is.

A simple context free grammar for a small fragment of English:

```
s -> np vp
np -> det n
vp -> v np
vp -> v
det -> a
det -> the
n -> woman
n -> man
v -> shoots
```

The arrow  $\rightarrow$  means its a rule. The symbols s, np, vp, det, n, v are non-terminals. In this case, each of them has a meaning from linguistics: s = sentence, np = noun phrase, vp = verb phrase and det = determiner. i.e. each symbol is shorthand for a grammatical category.

n = noun, v = verb

Finally, we have symbols a, the, woman, man, shoots. These are terminal symbols or words or lexical items.

This grammar contains 9 context free rules. A CFR consists of a single nonterminal, followed by an arrow and a finite sequence made of terminal and/or nonterminals.

Rule 1 tells us a sentence consists of a noun phrase and a verb phrase; and so on.

Is the string "a woman shoots a man" grammatically correct in our CFG?

```
s -> np vp
np -> det n
det -> a or the
vp -> v np or v
```

A woman shoots a man = det n v det n

$s = \text{det } n \text{ v det } n$

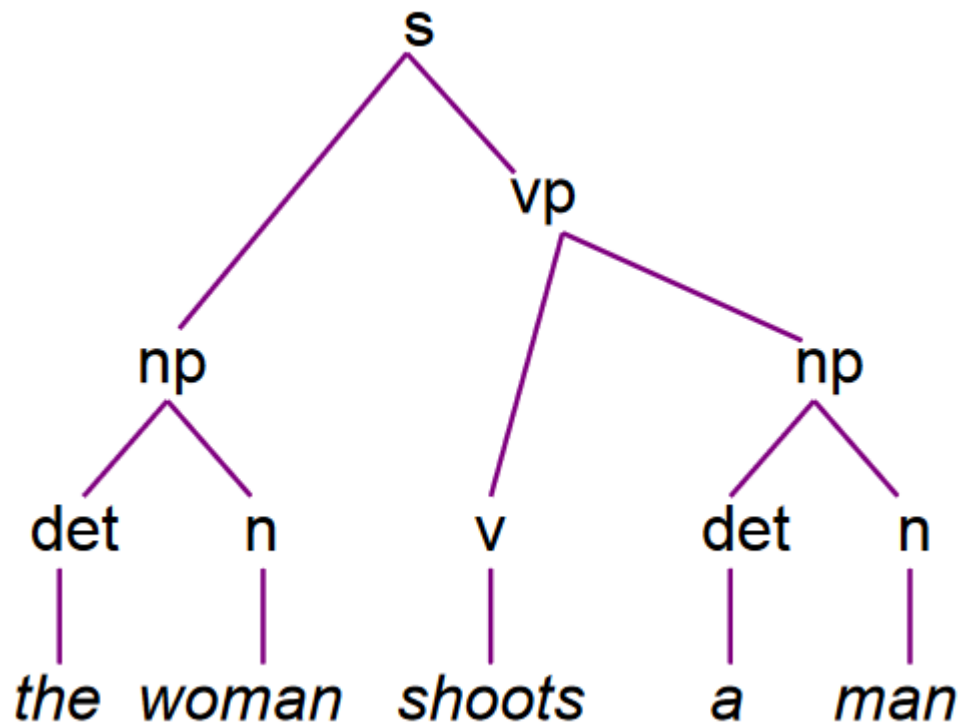
$s = \text{np } v \text{ np}$

$s = \text{np } \text{vp}$

Therefore it is grammatically correct for our CFG

### **Parse Tree**

The tree that can be used to answer the above question:



This is a parse tree; one which represents the syntactic structure of a string. They provide information about the string and its structure.

If we are given a string of words and a grammar, and it turns out we can build a parse tree then we can say that the string is grammatical for this particular grammar.

The language generated by a grammar consists of all the strings that the grammar classifies as grammatical.

### **Recogniser**

A context free recogniser is a program which correctly tells us whether or not a string belongs to the language generated by a CFG. Basically, it classifies strings as either grammatical or ungrammatical.

### **Parser**

A context free parser correctly decides whether a string belongs to the language generated by a context free grammar and it also tells us the structure.

A recogniser says yes or no but a parser also provides a parse tree.

### **CFG Recognition in Prolog**