Why is Graph Rewriting relevant to NLP?

- Graphs are a common framework well suited to linguistic representation.
- Graph rewriting is a nice computational model for linguistic graphs:
  - Every rewriting rule is able to model a local linguistic phenomenon.
  - Computations are non deterministic and can model the ambiguity of natural languages.
  - Applications for converting and correcting annotations can be easily implemented.

GREW, a tool for annotating corpora and exploiting annotated corpora - http://grew.fr

Guy Perrier and Bruno Guillaume, LORIA, Nancy

GREW, an implementation of Graph Rewriting adapted to NLP

- Right hand sides of rules are sequences of atomic commands.
- Nodes contain feature structures and represent linguistic entities.
- Edges are labelled and represent linguistic relations.
- Rules can be parametrised by lexical information.
- Strategies can be used to control the rules applications.

A GREW rule for the Graph Rewriting System from UD to SUD

```
rule rev_cop {
    pattern {
        ADJ[pos=ADJ];
        e: ADJ -[cop]-> COP;
    }
    without {
        ADJ -[case]-> PREP % Ex: je suis en colère
    }
    commands {
        del_edge e;
        shift_in ADJ ==> COP;
        shift_out ADJ =[csubj|nsubj|mark]-> COP;
        add_edge e:COP -> ADJ;
    }
}
```

Graph Matching, a very useful by-product of Graph Rewriting

- The pattern & without part of rewriting rules can be used to search for patterns in corpora.
- This is useful for corpora exploration, error mining and linguistic studies.
- Available as an online service: http://match.grew.fr

A Graph matching example

Searching number disagreement between verbs and their subject in UD_French-GSD

All cases of disagreement

```
pattern { M [upos=VERB]; M -[nsubj]-> N; M.Number <> N.Number }
```

When the “avoir” auxiliary is used, the verb does not agree with the subject: ils ont mangé un couscous

```
pattern { M [upos=VERB]; M -[nsubj]-> N; M.Number <> N.Number }
without { M -[aux]-> A; A [lemma=avoir] }
```

When the subject is the head of a coordination, the verb does not agree with it but with the whole coordinated expression: Jean et son père arrivent.

```
pattern { M [upos=VERB]; M -[nsubj]-> N; M.Number <> N.Number }
without { M -[aux]-> A; A [lemma=avoir] }
without { N -[conj]-> C1; }
```