DG(X) - eXtensible Dependency Grammar

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Joint work with Joachim Niehren and Denys Duchier

Programming Systems Lab

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- only handles syntax (no syntax-semantics interface)

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- use preference information

eXtensible Dependency Grammar DG(X)

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- compositional semantics construction: DG(d,t,s)

Overview

1. Topological Dependency Grammar: TDG
2. eXtensible Dependency Grammar: DG(X)
3. TDG = DG(d,t)
4. Semantics construction: DG(d,t,s)
5. System demo
6. Summary and outlook

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- Free Order Dependency Grammar (FODG) (Holan/Kubon/Platek 2001)

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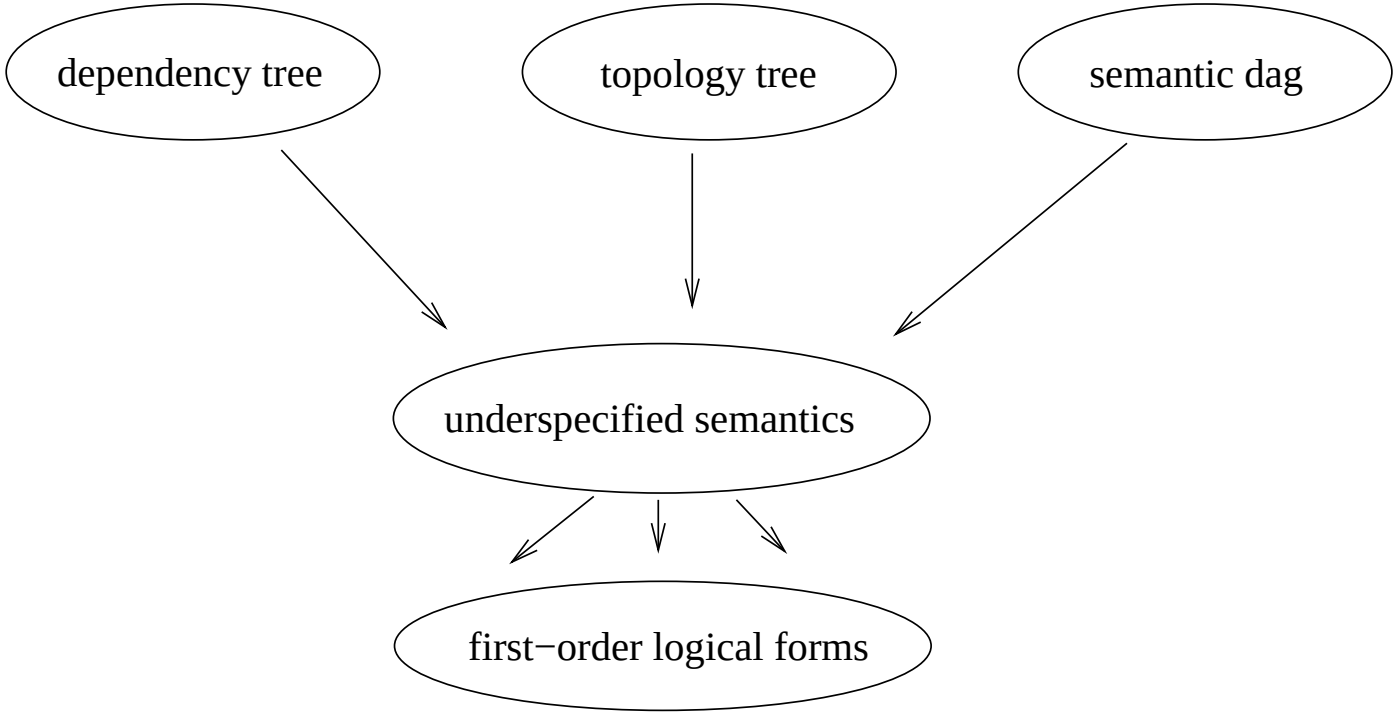

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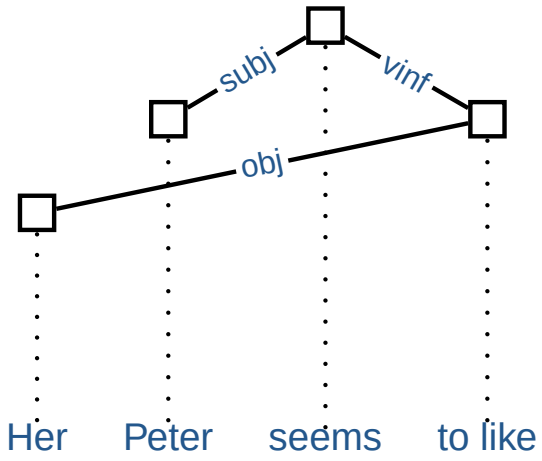
- topology tree is a flattening of the dependency tree

Example



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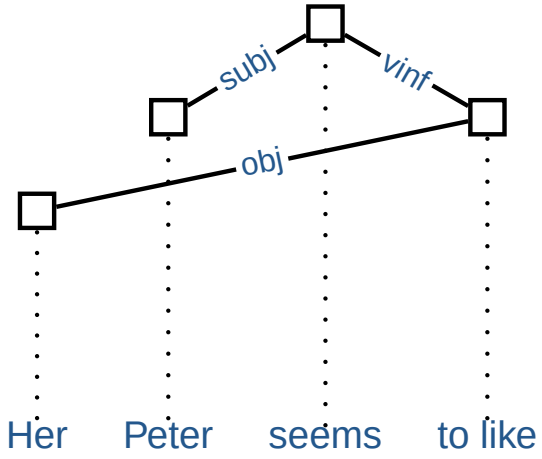
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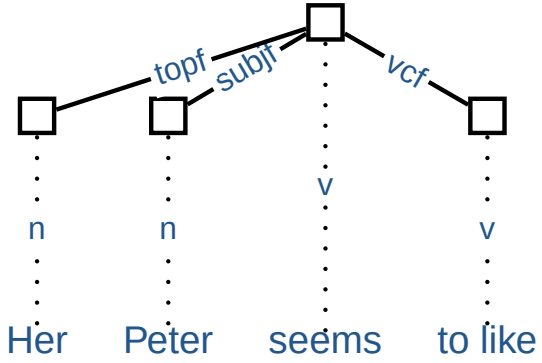
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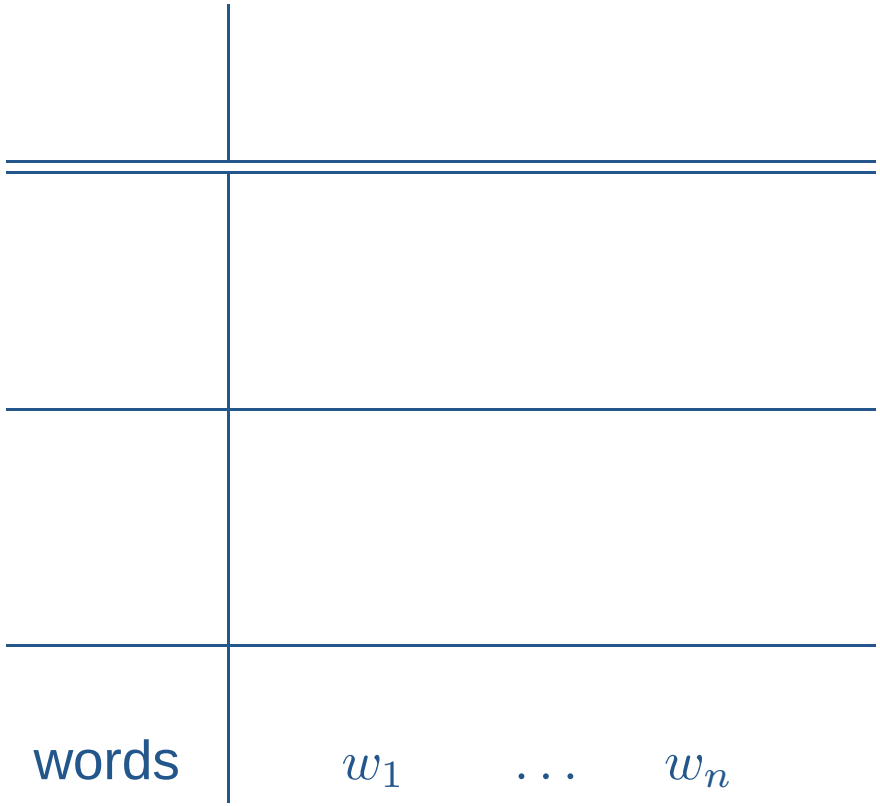
XDG architecture



- $w_1 \ldots w_n$ is the input string

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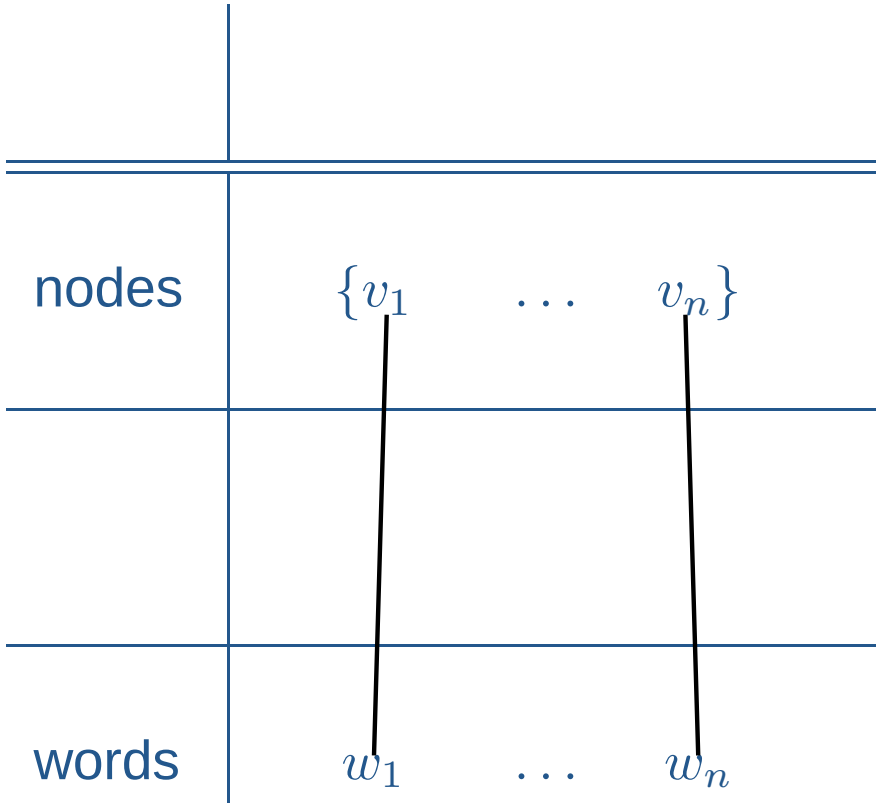

- each word w_i corresponds one-to-one to nodes v_i in node set V

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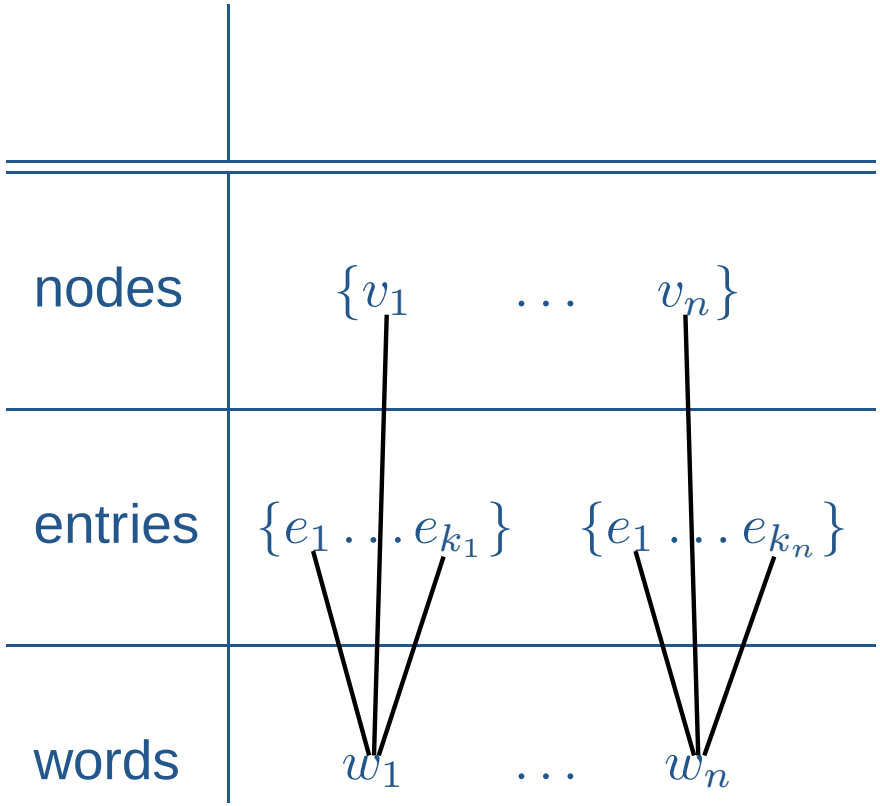

- each word w_i in the input string is assigned a set of lexical entries $\{e_1, \ldots, e_{k_i}\}$

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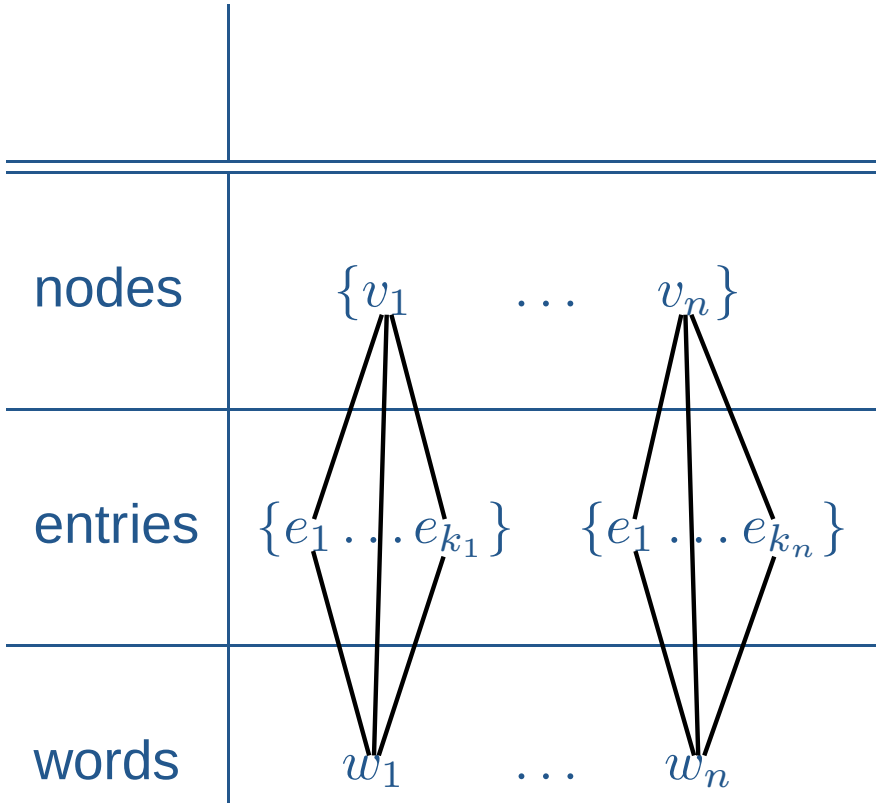

- each analysis selects for each node one of these lexical entries

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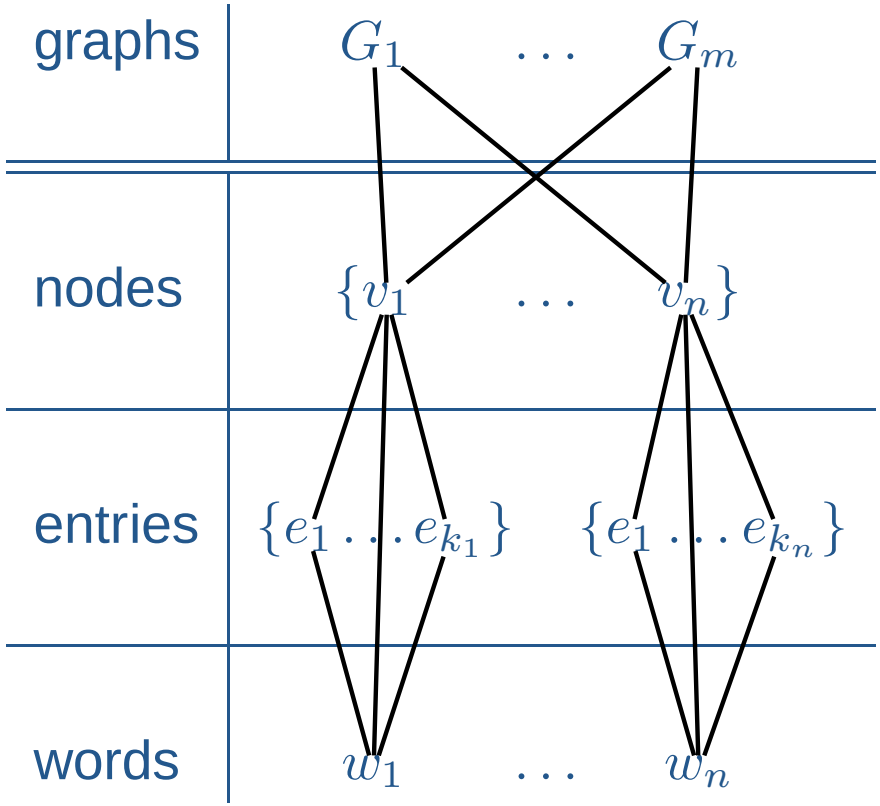

- the same node set V is shared across the m graphs $G_1, \ldots, G_m$

Graph G

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- more principles by constraint programming

Dag principle

$\mathsf{dag}(G)$: G is a directed acyclic graph.

Tree principle

$\mathsf{tree}(G)$: G is a tree.

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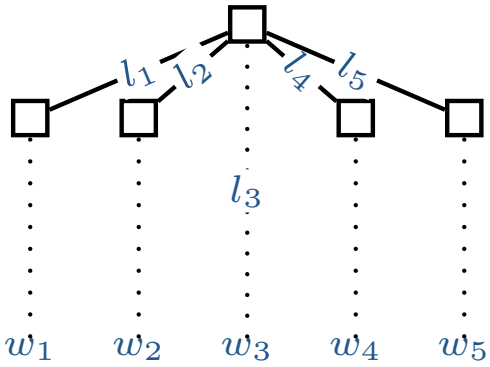

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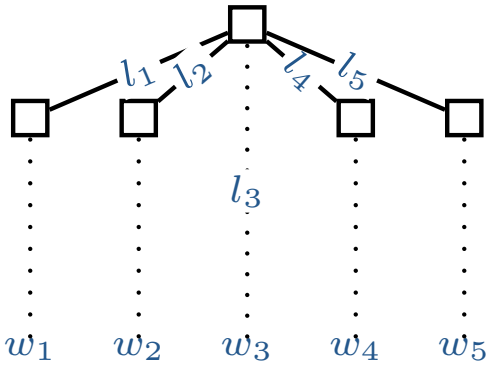

- $$l_i \prec l_j \quad \Rightarrow \quad w_i < w_j$$

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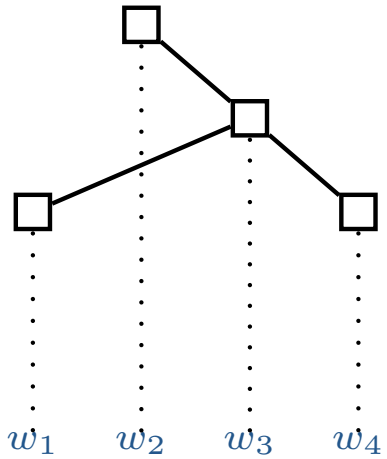

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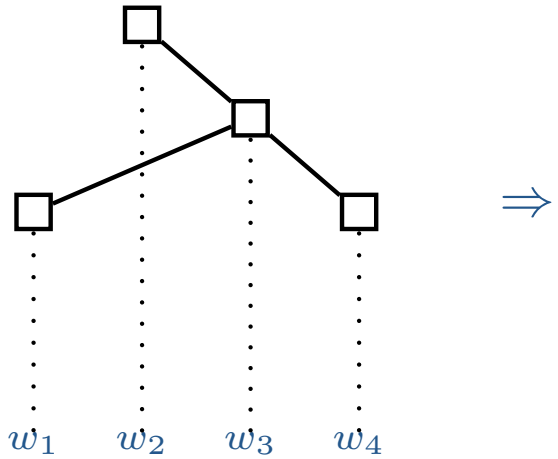

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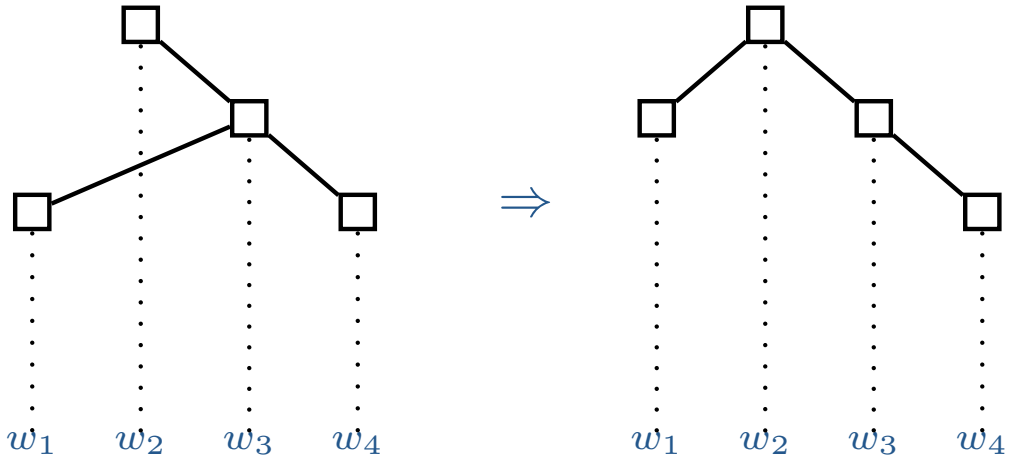

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$$L_t \quad = \quad \{\mathsf{topf}, \mathsf{subjf}, \mathsf{vcf}, \ldots\}$$

Lexicon

- lexical entry signature:

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- in, out and lab-functions lexicalized i.e. defined through the lexicon
- e.g. in_d:

$$\mathsf{in}_d(v) \quad = \quad \mathsf{lex}(v).d.\mathsf{in}$$

Principles

dependency	topology
$\mathsf{tree}(d)$	$\mathsf{tree}(t)$
$\mathsf{in}(d, \mathsf{in}_d)$	$\mathsf{in}(t, \mathsf{in}_t)$
$\mathsf{out}(d, \mathsf{out}_d)$	$\mathsf{out}(t, \mathsf{in}_t)$
	$\mathsf{order}(t, \mathsf{lab}_t, \mathsf{topf} \prec \mathsf{subjf} \prec \mathsf{vcf})$
$\mathsf{flatten}(d, t)$	

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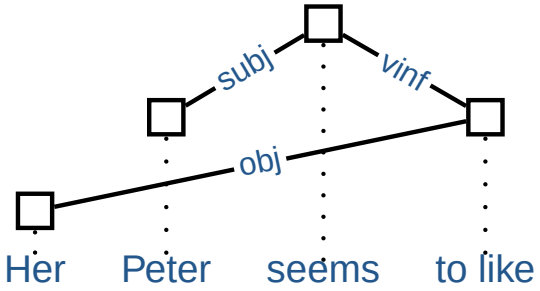
- CLLS based on dominance constraints (Marcus/Hindle/Fleck 83)

Example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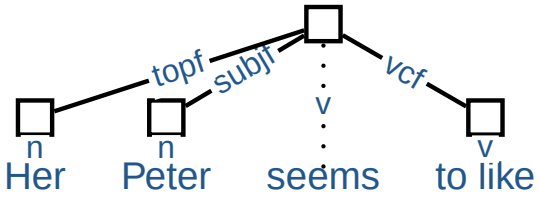
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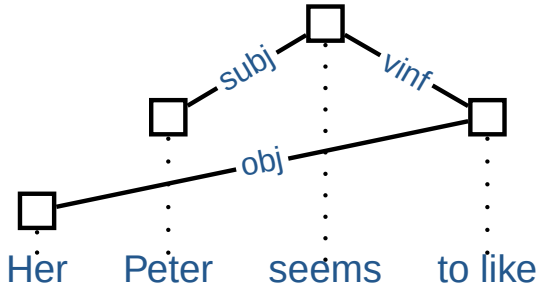
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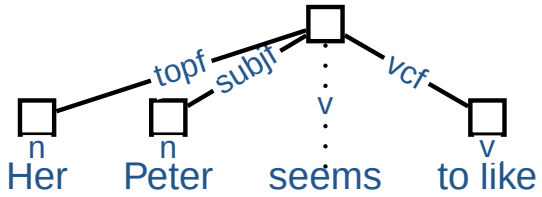
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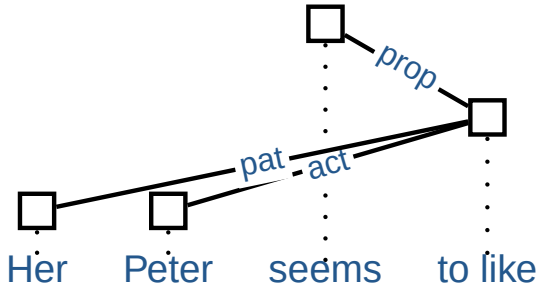
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Principles for the semantic dag

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- lexicalized linking principle mapping e.g. actor to subject

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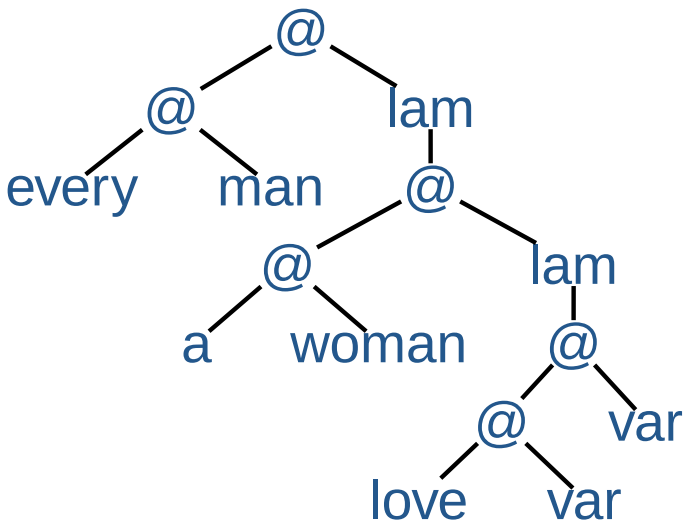

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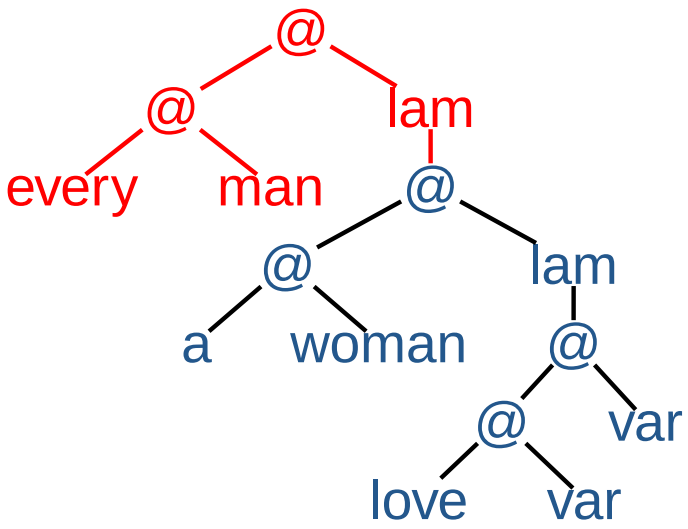

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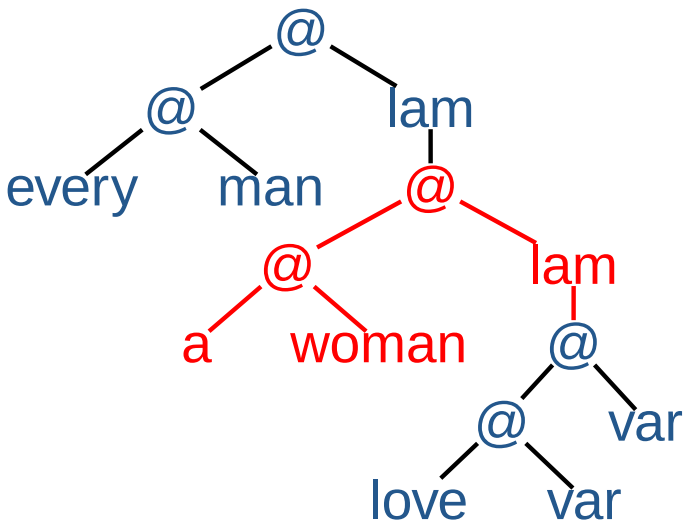

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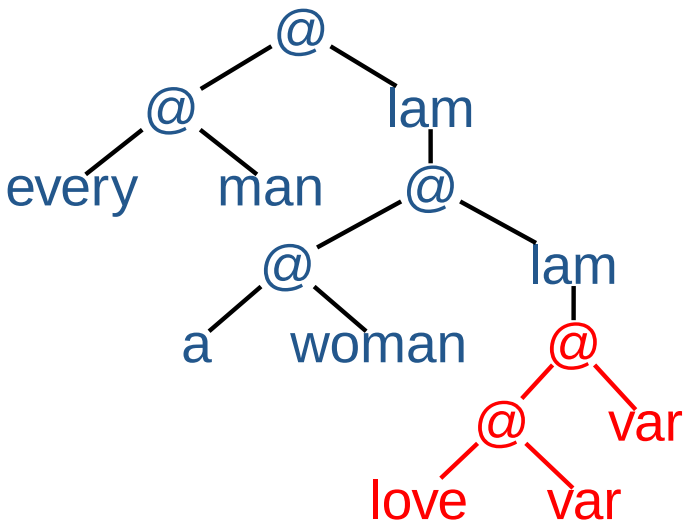

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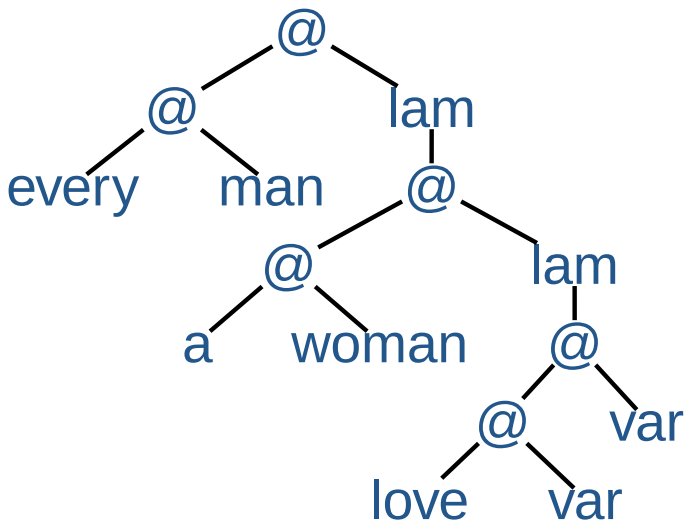

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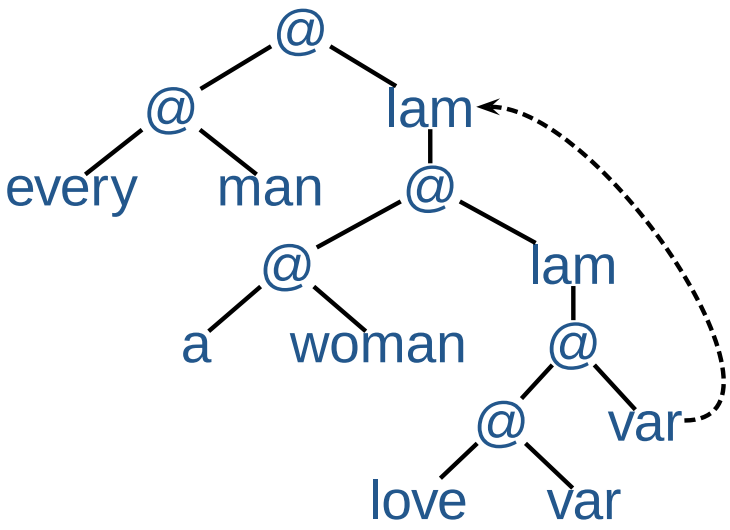

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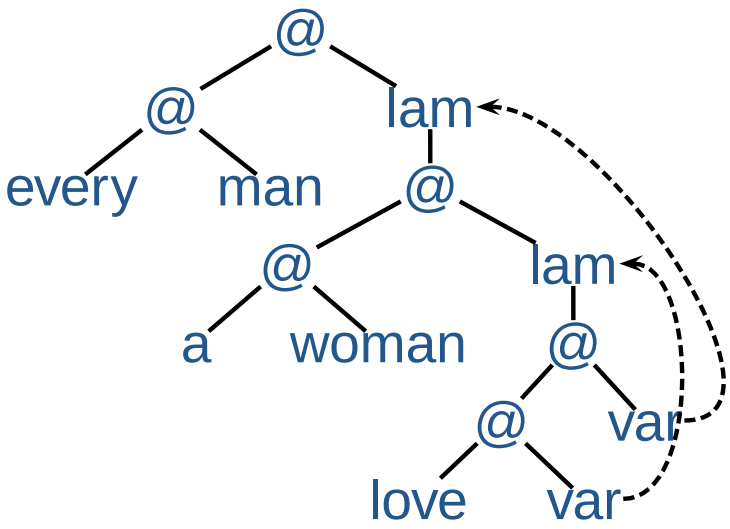

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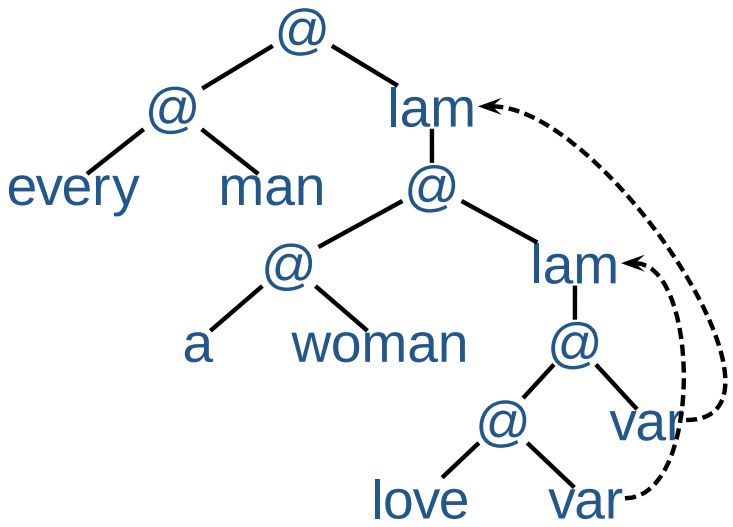

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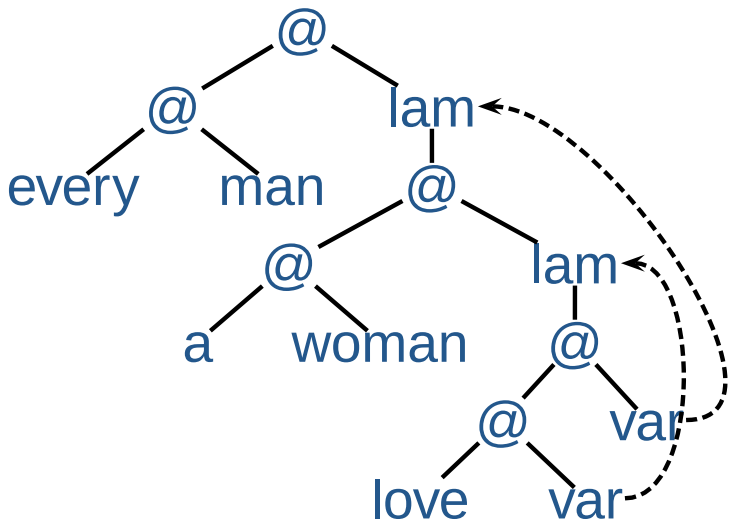

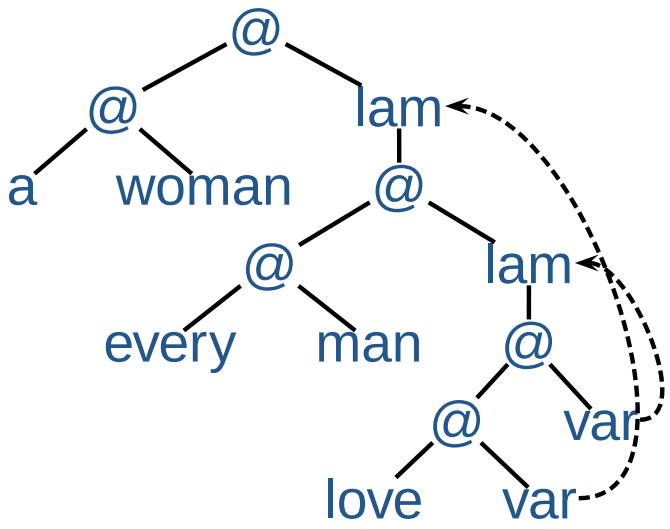

Underspecifi ed semantics

- underspecified representation of both readings:

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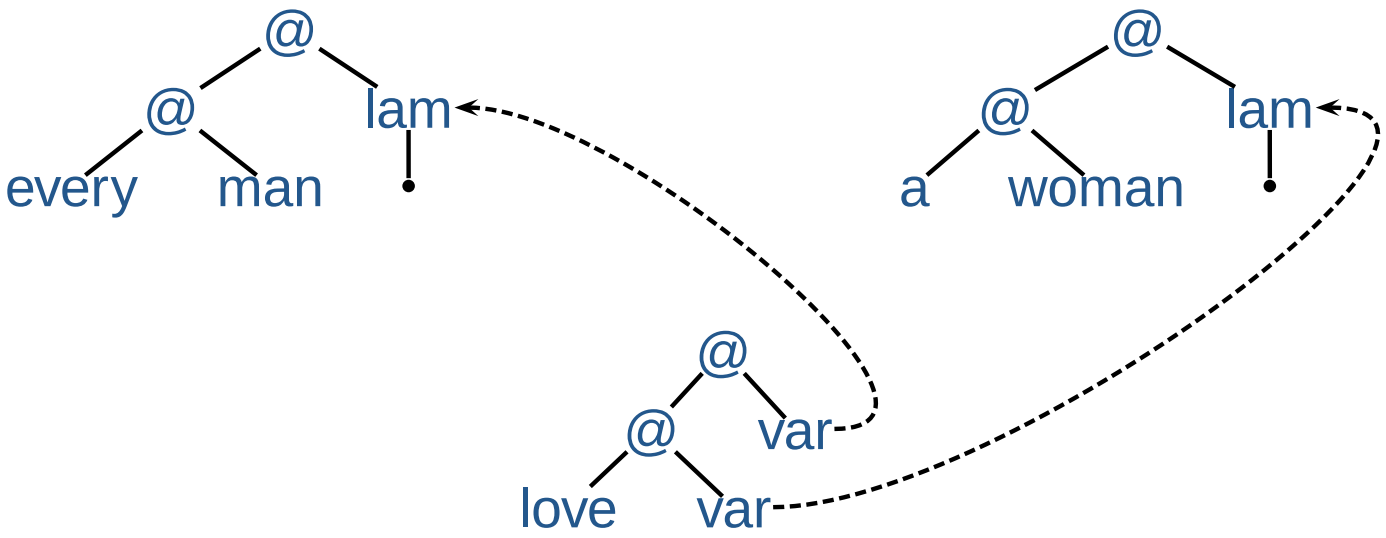
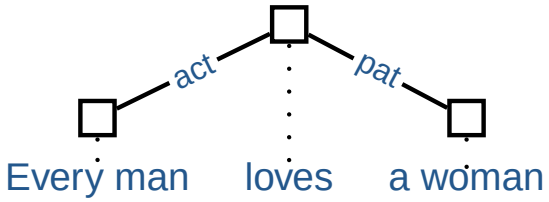
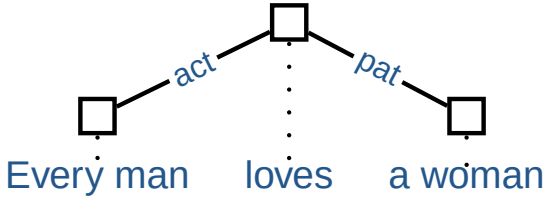
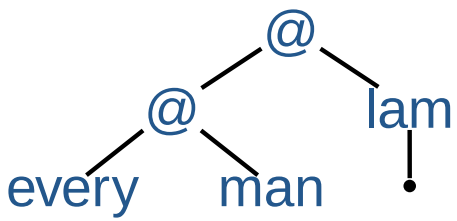


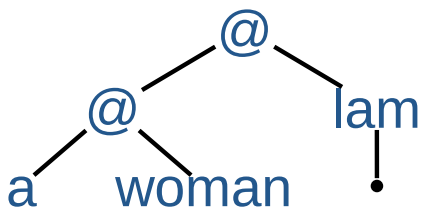
Semantics construction

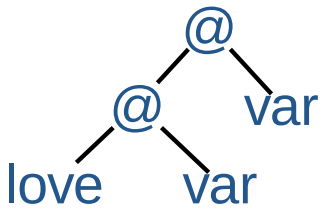


Semantics construction

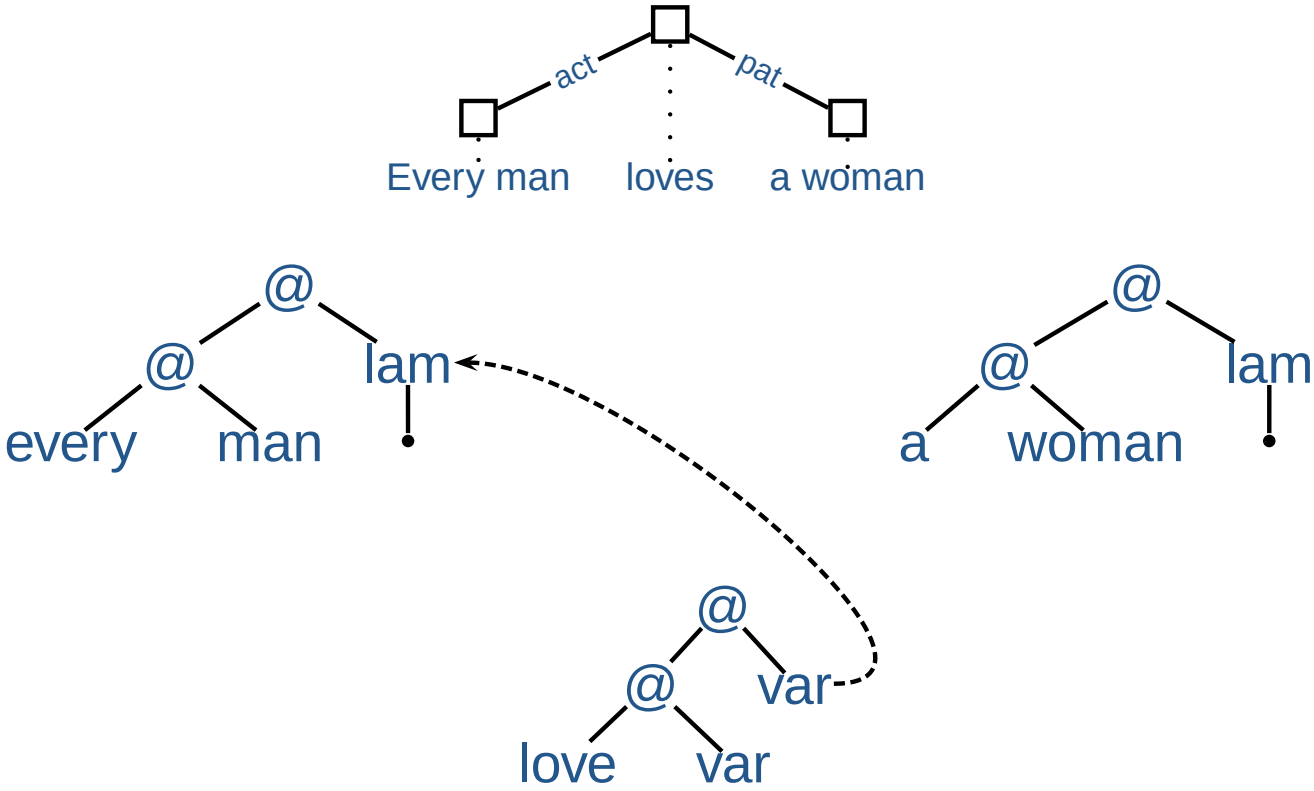




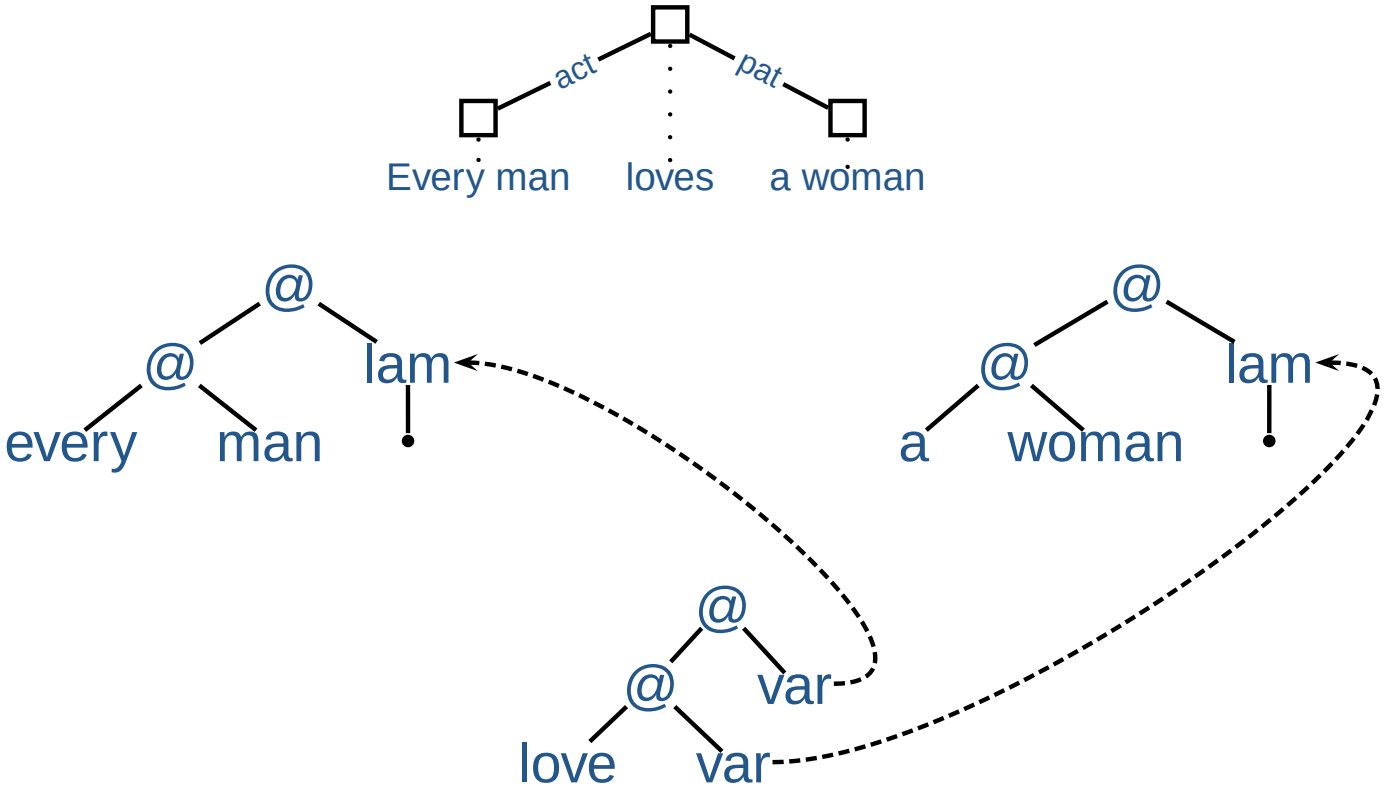




Semantics construction



Semantics construction



System demo

Summary

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- target semantics: CLLS

Outlook

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- interface to preferences (e.g. free modifiers or scope)