Linguistics 575:
Semantic Representations

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Overview

- Questions about getting ERG running?

- MRS

  - Goals, design principles

  - Flat semantics

  - Underspecified quantifier scope

  - Linguistic questions

  - NLP questions

- The Conduit Metaphor (and language use)

- Plans for next week (target corpora presentations)

MRS: Goals

- The design of the MRS formalism answers the following four general goals:

  - Adequate representation of NL semantics

  - Grammatical compatibility

  - Computational tractability

 - Underspecifiability

MRS: Design Principles

- The design of the representations of particular linguistic phenomena follow the following general strategies/design principles

    - Represent all semantic distinctions which are syntactically or morphologically marked

    - Underspecify semantic distinctions which aren't: These can be spelled-out/ambiguated if necessary in post-processing

    - Abstract away from non-semantic information (word order, case, …)

    - Close paraphrases should have comparable or identical MRS representations

    - Aim for consistency across languages

    - Allow for semantic differences across languages

A quick reminder about quantifier scope

- Quantifiers (predicate logic or NL) take three arguments:

  - A variable to bind

  - A restriction

  - A body

- Every dog sleeps: $\forall x \; dog(x) sleep(x)$

- When one quantifier appears within the restriction or body of another, we say the second has wider scope
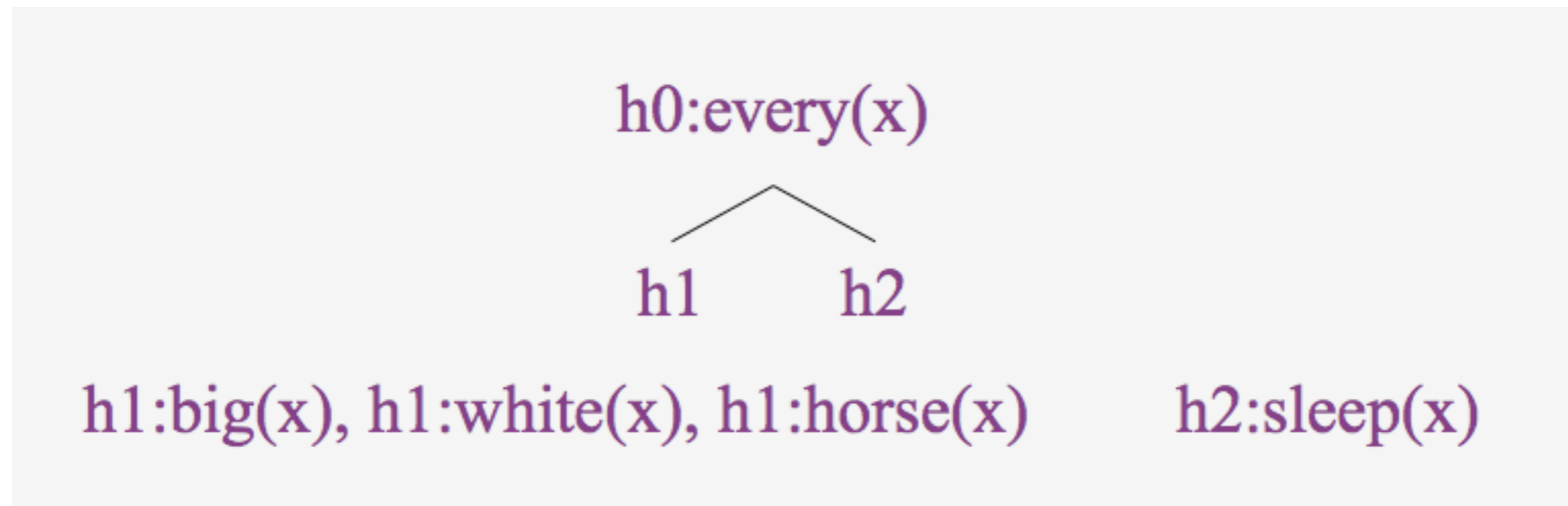
Working towards MRS (1/4)

- Every big white horse sleeps

- $\mathrm{every}(x, \wedge\mathrm{big}(x), \wedge(\mathrm{white}(x), \mathrm{horse}(x))), \mathrm{sleep}(x))$

Working towards MRS (3/4)
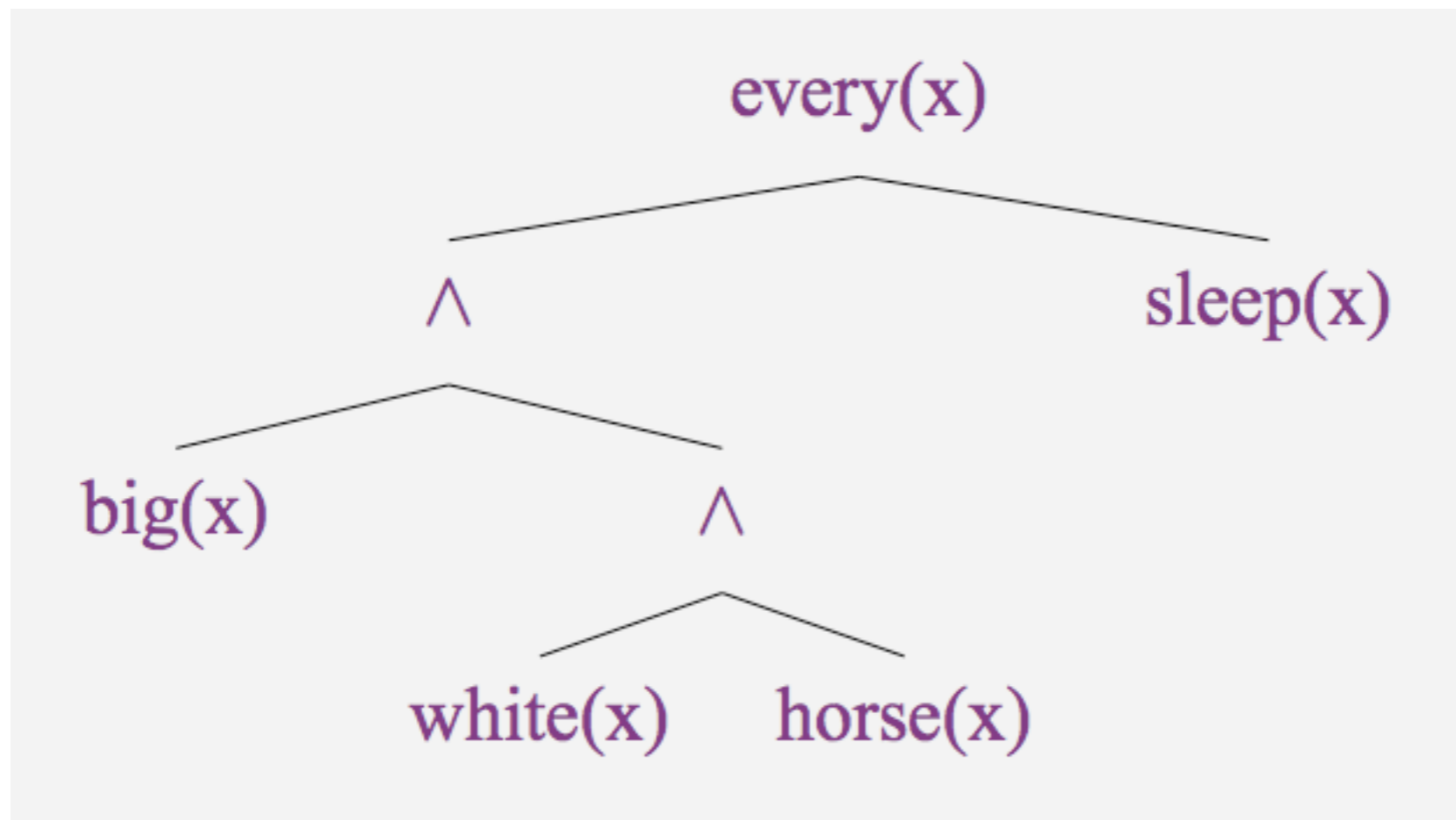
h0:every(x)
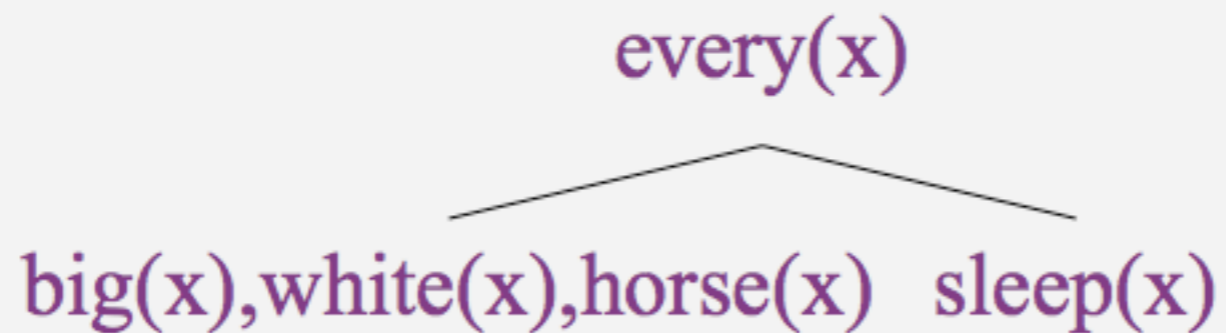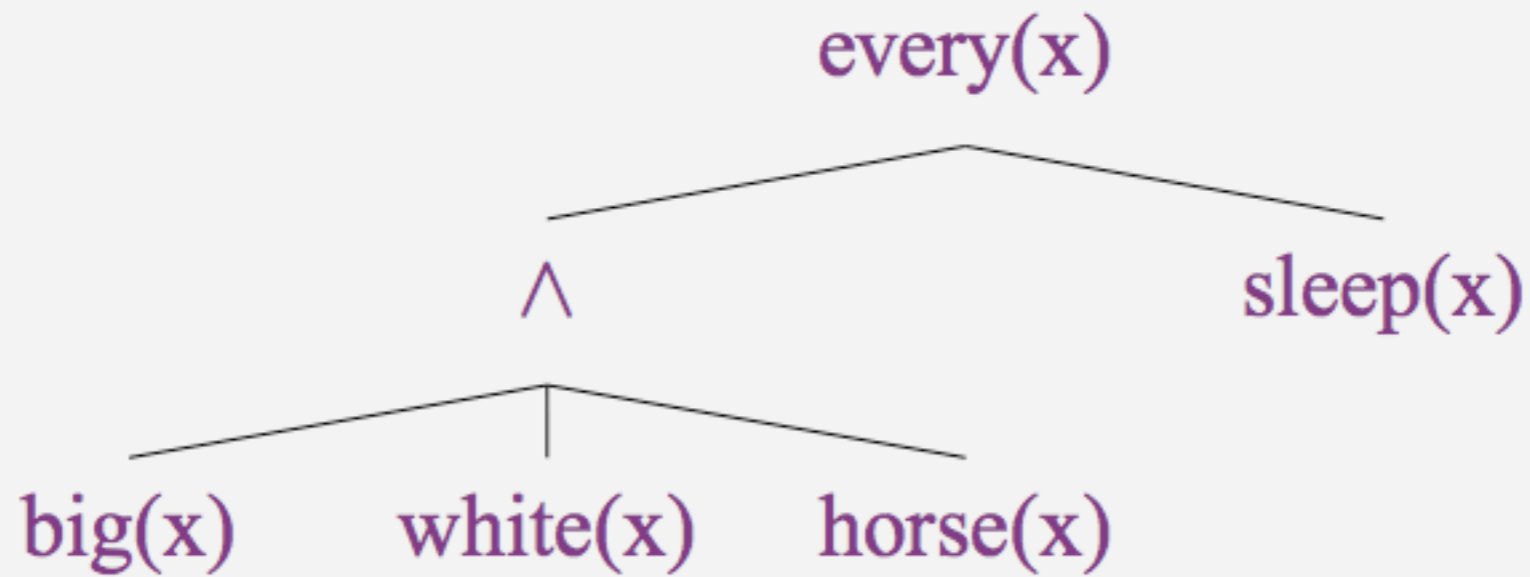
h1   h2

h1:big(x), h1:white(x), h1:horse(x)   h2:sleep(x)

- And finally:

$h0$:every($x, h1, h2$), $h1$:big(x), $h1$:white(x), $h1$:horse(x), $h2$:sleep(x)

Working towards MRS (4/4)

- This is a flat representation, which is a good start.

- Next we need to underspecify quantifier scope, and it's easier to see why with multiple quantifiers.

- At the same time, we want to be able to partially specify it, since this is required for adequate representations of NL semantics.

Underspecified quantifier scope (1/2)

- Every dog chases some white cat.
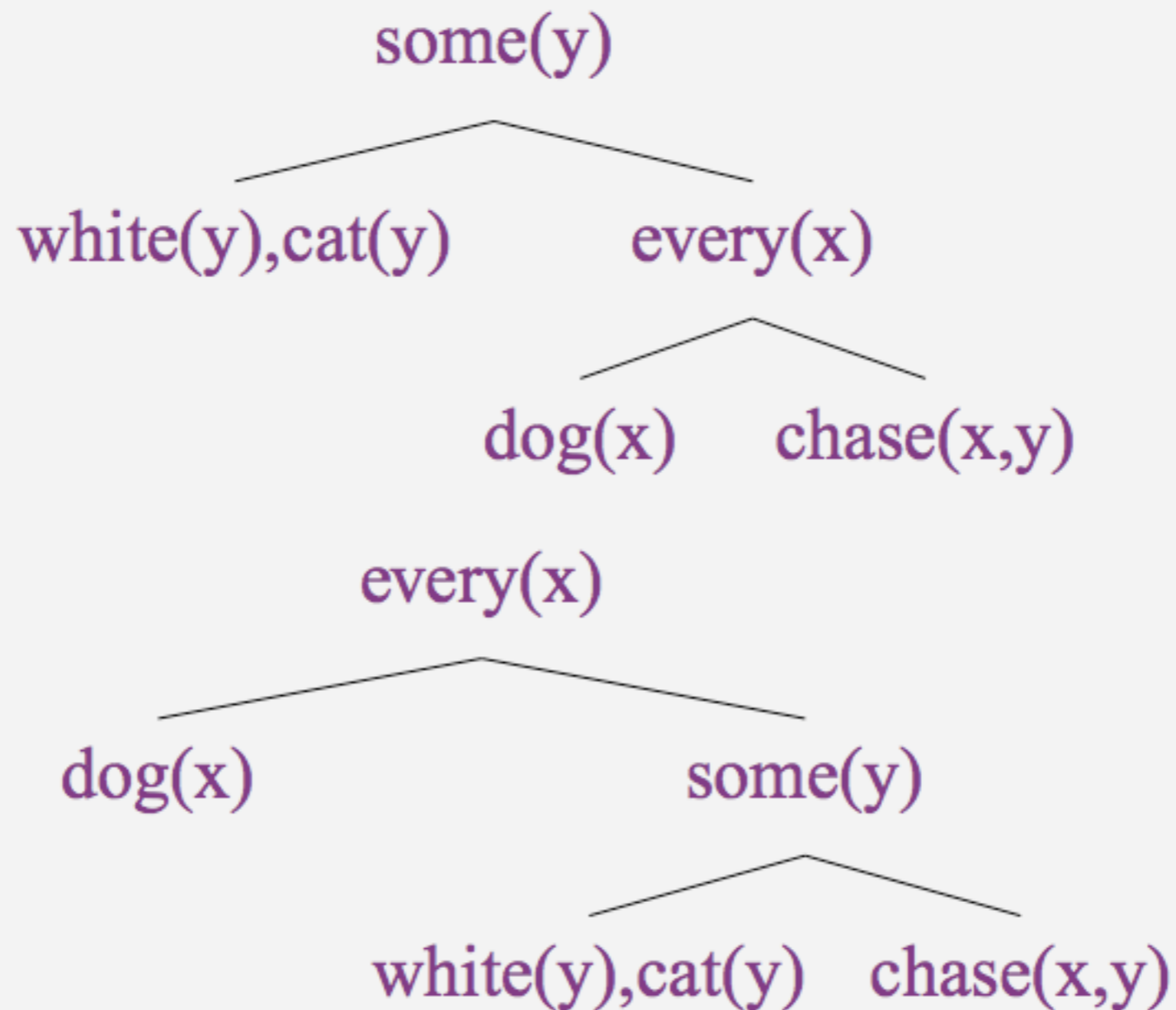
Underspecified quantifier scope (2/2)

- *h1*:every(*x,h3,h4*), *h3*:dog(*x*), *h7*:white(*y*), *h7*:cat(*y*), *h5*:some(*y,h7,h1*), *h4*:chase(*x,y*)

- *h1*:every(*x,h3,h5*), *h3*:dog(*x*), *h7*:white(*y*), *h7*:cat(*y*), *h5*:some(*y,h7,h4*), *h4*:chase(*x,y*)

- *h1*:every(*x,h3,hA*), *h3*:dog(*x*), *h7*:white(*y*), *h7*:cat(*y*), *h5*:some(*y,h7,hB*), *h4*:chase(*x,y*)
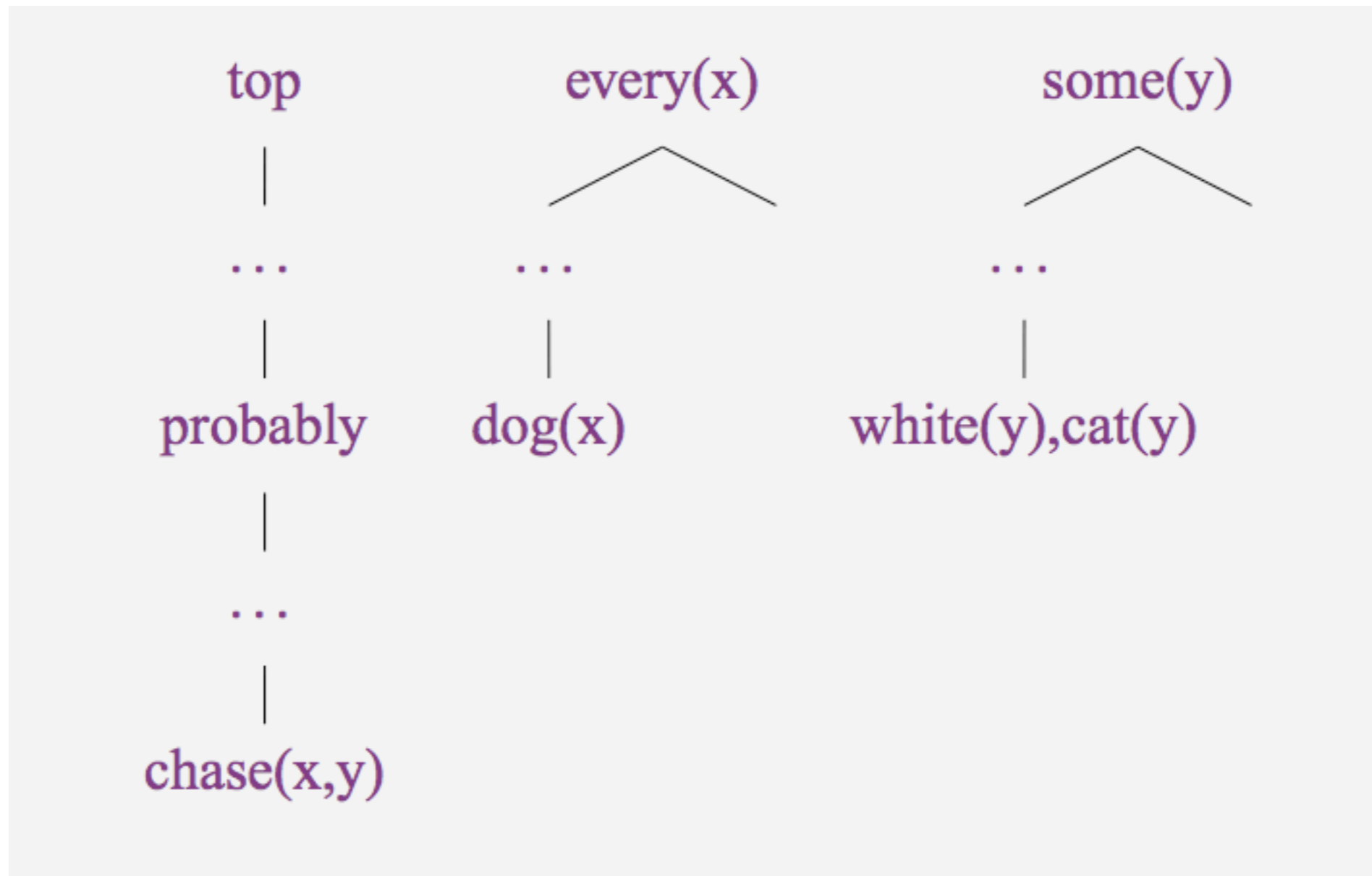
Partially constrained quantifier scope (1/4)

- For the BODY of quantifiers, we have no particular constraints to add.

- In turns out that the RESTRICTION needs to have partially underconstrained scope:

  - Every nephew of some famous politician runs.

    - every(x,some(y,famous(y) ∧ politician(y), nephew(x,y)) run(x))

    - some(y,famous(y) ∧ politician(y), every(x, nephew(x,y),run(x)))

  - But not:

    - every(x,run(x),some(y,famous(y) ∧ politician(y), nephew(x,y)))

    - 'Everyone who runs is a nephew of a famous politician.'

Partially constrained quantifier scope (2/4)
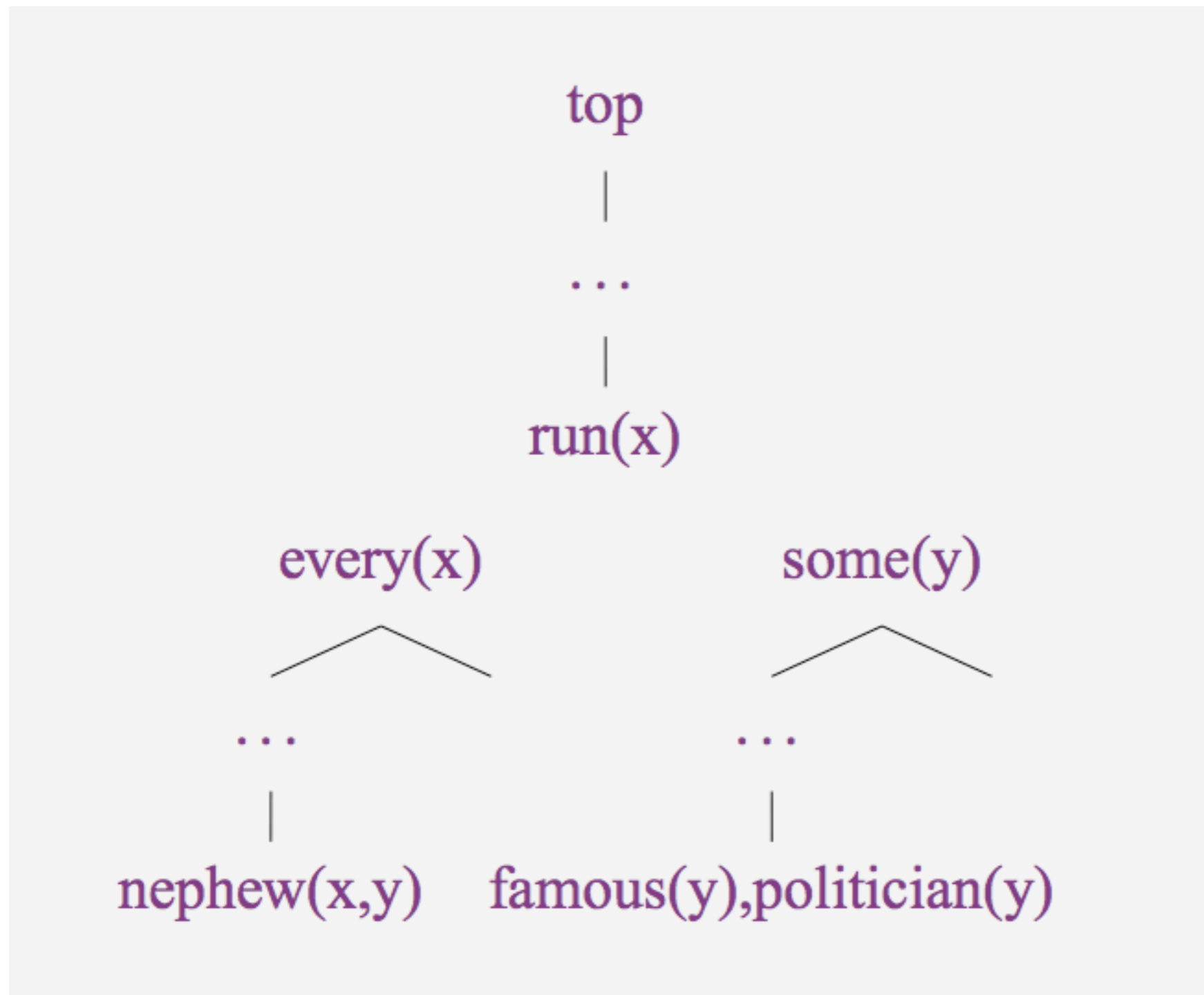
Partially constrained quantifier scope (3/4)

Partially constrained quantifier scope (4/4)

$\langle h0, \{h2 : \text{every}(x, h3, h4), h5 : \text{nephew}(x, y),$
$h6 : \text{some}(y, h7, h8), h9 : \text{politician}(y), h9 : \text{famous}(y),$
$h10 : \text{run}(x)\},$
$\{h1 =_q h10, h7 =_q h9, h3 =_q h5\}\rangle$

$\langle h0, \{h1 : \text{every}(x, h2, h3), h4 : \text{dog}(x),$
$h5 : \text{probably}(h6), h7 : \text{chase}(x, y),$
$h8 : \text{some}(y, h9, h10), h11 : \text{white}(y), h11 : \text{cat}(y)\},$
$\{h0 =_q h5, hw =_q h4, h6 =_q h7, h9 =_q h11\}\rangle$

We've arrived at MRS!

- Flat structure

- Underspecification & partial specification of quantifier scope are possible

Linguistic Questions

- How do we build MRS representations compositionally?

- Is it linguistically adequate to insist that no process suppress relations?

- Under what circumstances do NLs (partially) constrain scope?

- Is it linguistically adequate to give scopal elements (esp. quantifiers, but also scopal modifiers) center-stage?

NLP Questions

- Is MRS able to capture everything that is needed for further processing?

- Is MRS able to capture everything that is available for further processing?

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Conduit metaphor, "major framework" (Reddy 1979: 290)

1. language functions like a conduit, transferring thoughts bodily from one person to another

2. in writing and speaking, people insert their thoughts or feelings in the words

3. words accomplish the transfer by containing the thoughts or feelings and conveying them to others

4. in listening or reading, people extract the thoughts and feelings once again from the words

Conduit metaphor, "minor framework" (Reddy 1979: 291)

1. thoughts and feelings are ejected by simply speaking them into an external "idea space"

2. thoughts and feelings are reified in this external space, so that they exist independently of any need for living human beings to think or feel them

3. these reified thoughts and feelings may, or may not, find their way back into the heads of living humans

Questions

- Do you subscribe to the conduit metaphor in your non-academic understanding of how language works?

- Do the NLP technologies that you work with/plan to work with incorporate the conduit metaphor, and in what ways? How might this affect their success?

- In what ways do they reject it?

Toolmaker's paradigm/radical subjectivism (Reddy 1979)

1. Each person has their own environment, with their own "indigenous materials"

2. Communication involves using language (and other signals) as clues to construct private representations from indigenous materials

3. Each interlocutor's representations will be scattered (different) unless they expend energy to coordinate them

- What do you think of this? How does it map to your experience of language use? To your NLP projects?

Clark 1996: *Using Language*

- Words and sentences are *types* of signals, linguistic units abstracted away from any occasion on which they might be used, stripped of all relation to particular speakers, listeners, times, and places. To describe them is to describe the conventions for their use within speech communities. But utterances are the actions of producing words, sentences, and other things on particular occasions by particular speakers for particular purposes. (p.128)

- What does MRS represent?

- What about meaning representations you are working with?

Clark 1996: *Using Language*

- If communicative acts are joint acts, can a machine actually be an interlocutor? What would it need to be able to do in order to do so?

- Are the views of Clark and Reddy compatible?

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