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# Putting Context in Constructions

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# Context is important

- Context supports
    - Language understanding
    - Language learning
  - Issues to be solved:
    - Representing context and constructions
    - Incorporating context information in analysis
    - Using context information to trigger learning
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# Interpretation of deictic references relies on context

*Put the coat over here.*

# Pronominal references often appear without expressed antecedents in dialogues

Mother: *are **they** clean yet ?*

Eve: ***they** clean. ...*

Mother: ***they**'re pretty clean.*

Eve: *let me wash **them**. ...*

Mother: *just wash a little bit right in there.*

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# Omitted arguments in pro-drop languages can only be recovered from context

Xixi:            *zang1*.            (*dirty*)

Mother:        *zang1 le* .        (*dirty ASPECT*)

Xixi:            *ei xi3+xi3* .        (*INTERJ wash+wash*)

Mother:        *en xi3 xi3* .        (*INTERJ wash+wash*)

Mother:        *xing2* .            (*alright*)

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These phenomena have these commonalities:

- Context-dependent interpretation
- Context-dependent usage

Construction grammar is well suited to capture these semantic requirements

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*Put the coat over here.*

1. Representation
2. Best-fit Analysis
3. Grammar Learning

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# Embodied Construction Grammar supports simulation-based language understanding

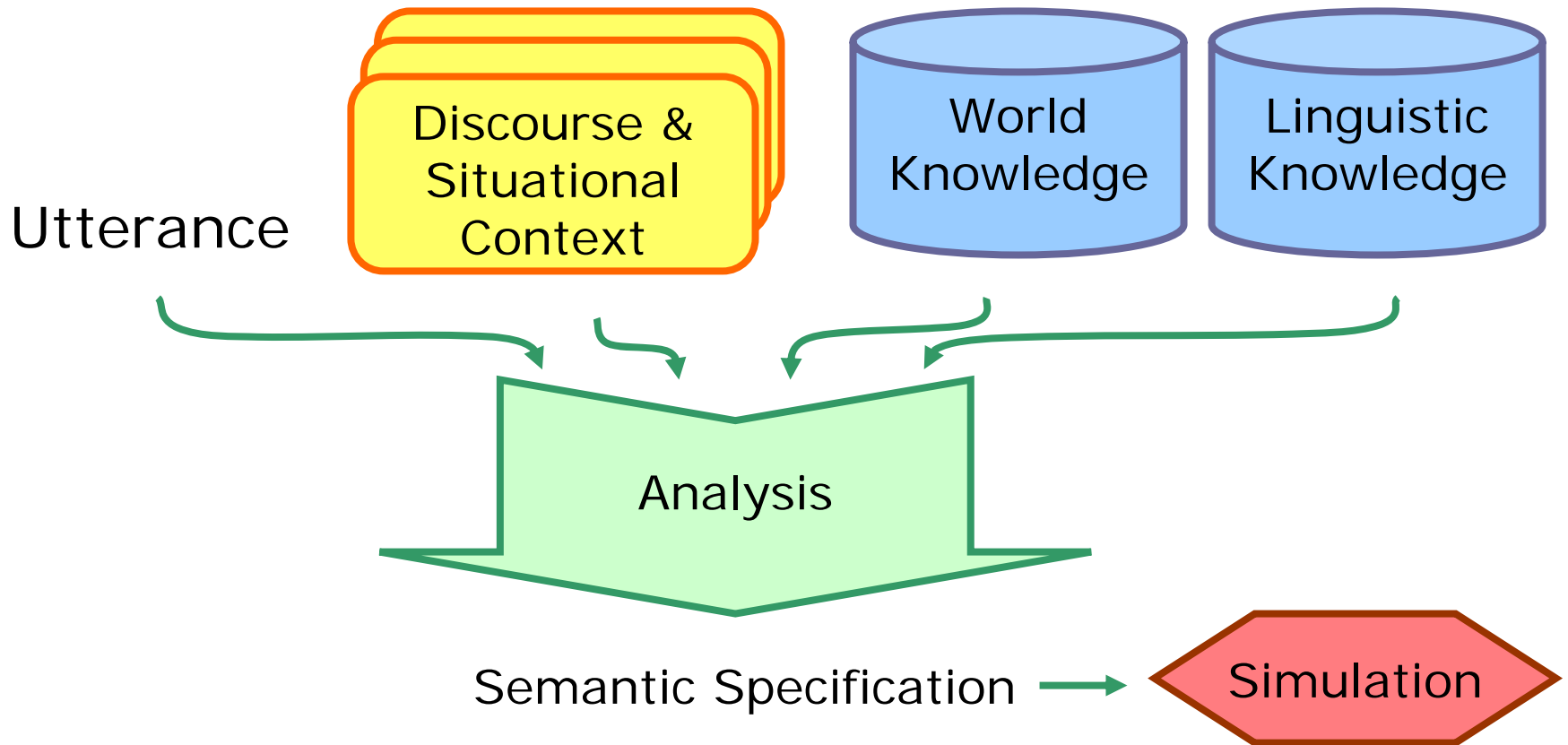
- Pairing of form and meaning
- Meaning is represented as embodied schemas:
  - action, perception, emotion, attention, perspective

“put” —

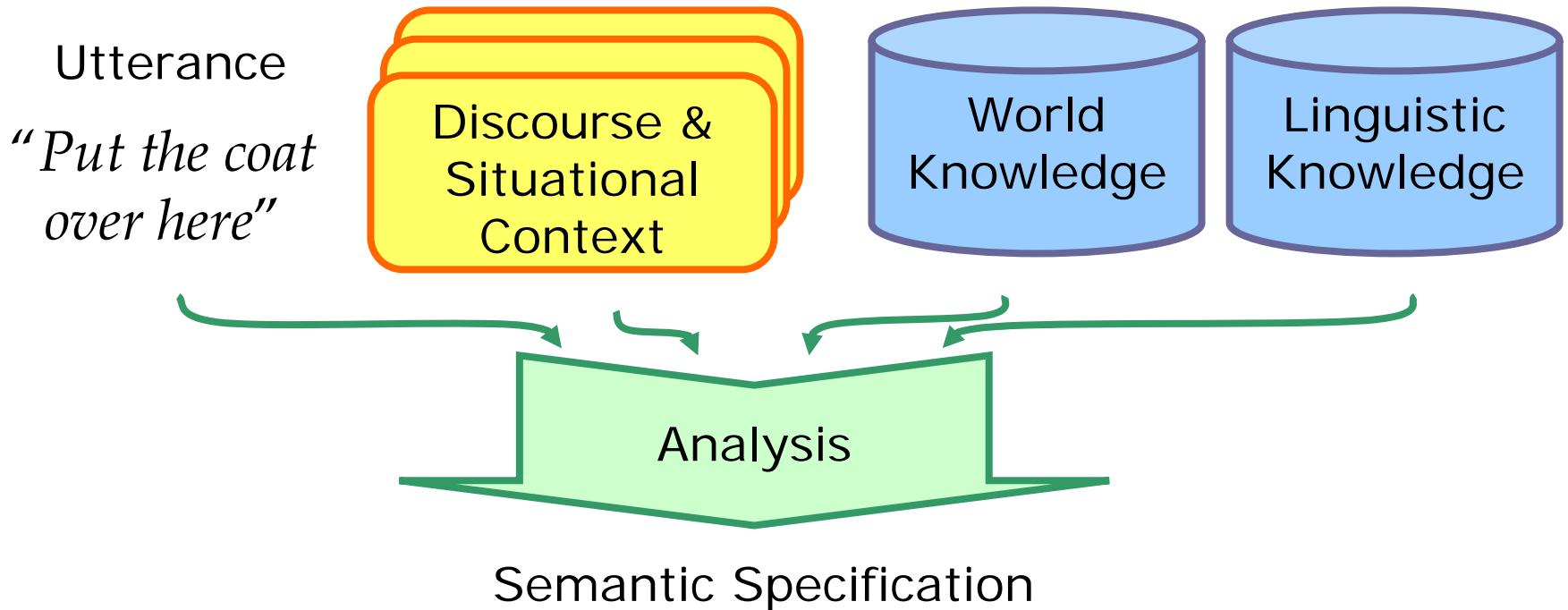


- Computationally precise
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# Understanding an utterance in context: analysis and simulation



# Understanding “Put the coat over here”



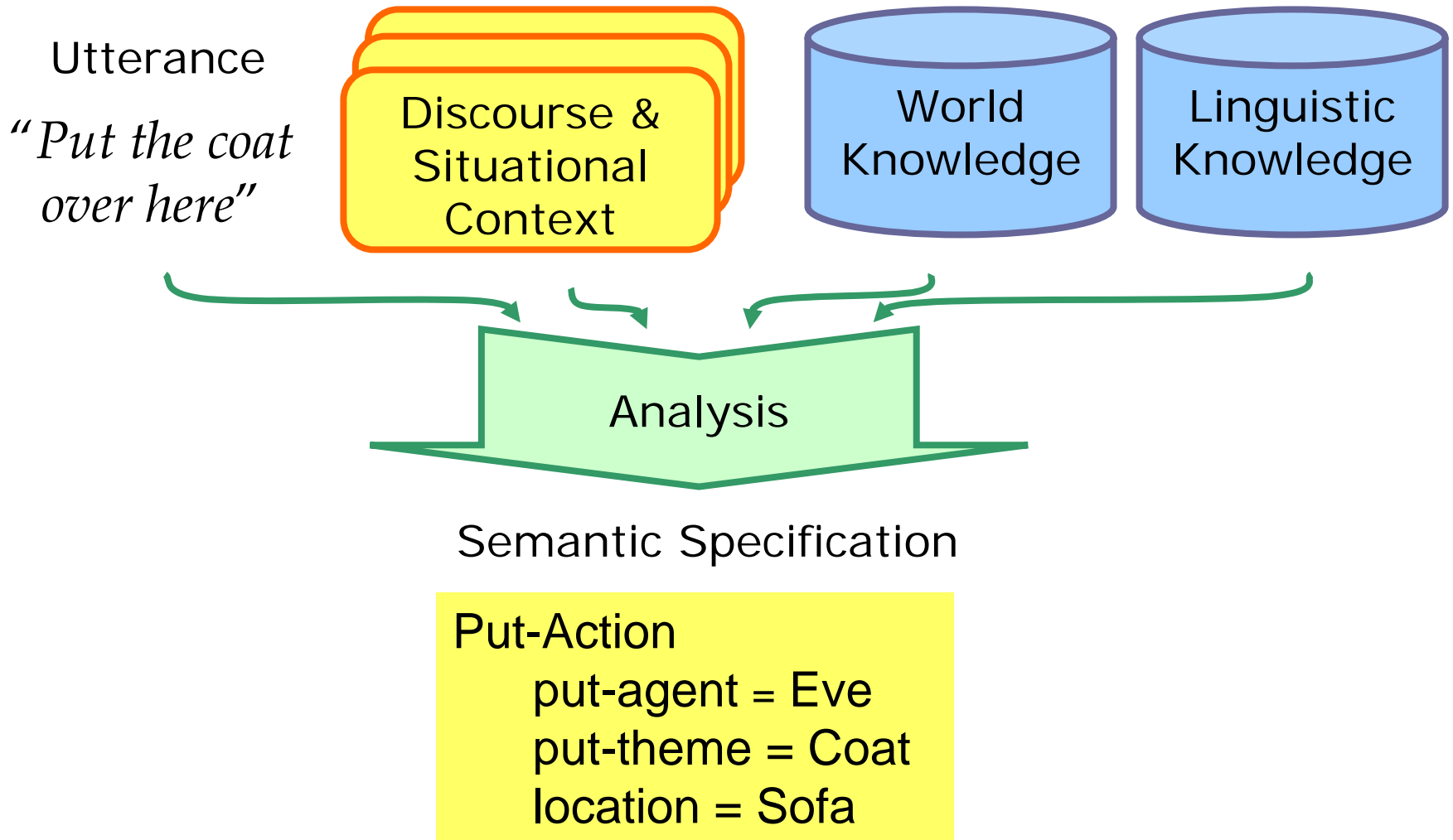
## Put-Action

put-agent = Addressee

put-theme = {some accessible coat}

location = {some place}

# Understanding “Put the coat over here”



# The context of “*Put the coat over here*”

## Discourse Segment:

DS01

speaker = Mother

addressee = Eve

attentional-focus = Sofa

content = { “*Put the coat over here*” }

speech-act = command

## Discourse:

Discourse01

participants = Eve , Mother

objects = Coat, Sofa, Table...

discourse-history = DS01

situational-history

# Representing the put action and the “put” construction

schema Put-Action

roles

put-agent : animate

put-theme : thing

location : place

construction Put

form

$s_f.orth \leftarrow \text{“put”}$

meaning: Put-Action

# An imperative version of Caused Motion

(that a child may learn)

construction Imperative-Caused-Motion

constituents

v: Caused-Motion-Verb  
o: Referring-Expression  
p: Path-Expression

form

$v_f$  before  $o_f$  before  $p_f$

meaning: Caused-Motion-Scene

$self_m.causer \leftrightarrow DS.addressee$

$self_m.means \leftrightarrow v_m$

$self_m.mover \leftrightarrow o_m$

$self_m.path \leftrightarrow p_m$

**Discourse Segment:**

speaker  
addressee  
attentional-focus  
content  
speech-act

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“Here” refers to some place in context

schema Deixis

roles

deictic-center : place

referent : place

construction here

form

$s_f.orth \leftarrow \text{“here”}$

meaning: place

evokes Deixis as deixis

$deixis.deictic-center \leftrightarrow DS.speaker$

$deixis.referent \leftrightarrow s_m$

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# Analysis draws on constructions and context

## Put-Action

put-agent: Addressee  
put-theme: {some coat}  
location: {some place}

## Discourse Segment:

DS01

speaker = Mother

addressee = Eve

attentional-focus = Sofa

content = {*"Put the coat over here"*}

speech-act = command

## Discourse:

Discourse01

participants = Eve , Mother

objects = Coat, Sofa, Table...

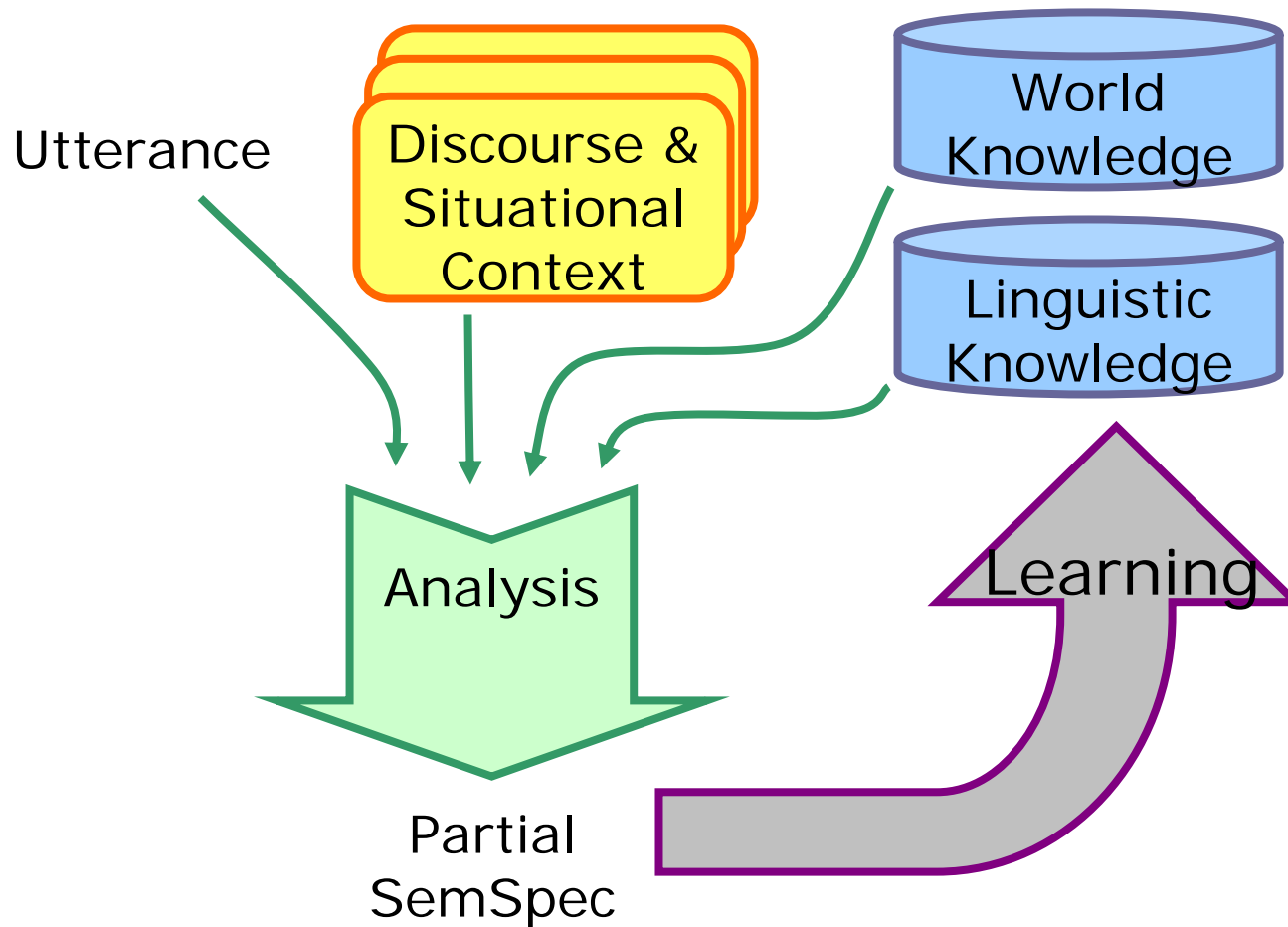
discourse-history = DS01

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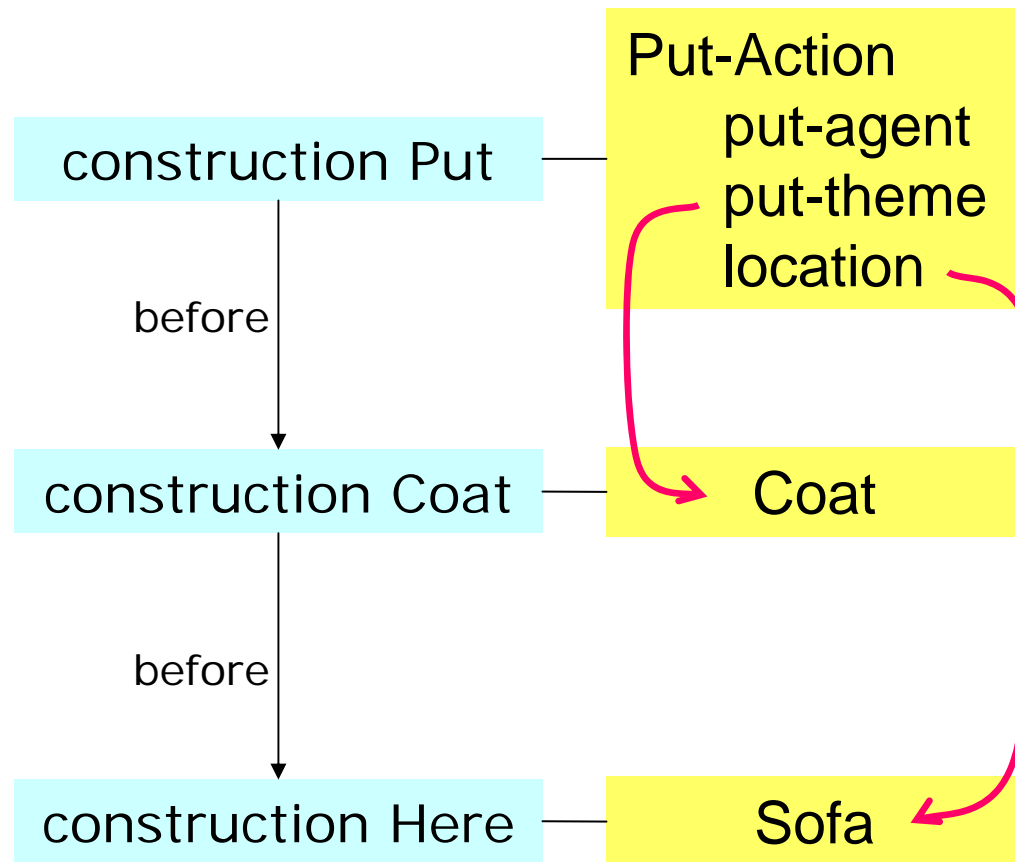
ECG, together with models of context and language use, supports precise analysis

- Our context model allows situational and discourse context to be expressed schematically
  - Semantic constraints are captured in ECG
  - Best-fit analysis takes into account **linguistic**, **constructional** and **contextual** constraints
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# Contextual information can trigger the learning of new constructions



# The intuition behind learning a new form-meaning pairing from context



# The learner learns a new lexically-specific construction from the form-meaning pair

construction Put-Coat-Here

constituents

v: Put

o: Coat

p: Here

form

$v_f$  before  $o_f$  before  $p_f$

meaning: Caused-Motion-Scene

$\text{self}_m.\text{means} \leftrightarrow v_m$

$\text{self}_m.\text{mover} \leftrightarrow o_m$

$\text{self}_m.\text{path} \leftrightarrow p_m$

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The only way to learn from sentences with omitted argument is to rely on context

- Recover from context:
    - semantically required arguments that are omitted from the utterance
    - i.e., **core** frame elements
  - Learn:
    - Do they need to be expressed? When?
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An argument is omissible when, given the same context, it does not always appear

Context

**Wash-Action**

*xi3+xi3* (wash+wash)

[ washer = Xixi  
washed = Hands ]

Context

**Wash-Action**

*xi3+xi3 shou3* (wash+wash hands)

[ washer = Xixi  
washed = Hands ]

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## In addition to supporting language analysis,

- Our context model makes it possible for the learning model to:
    - learn new constructions using contextually available information
    - learn argument-structure constructions in pro-drop languages
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