

Ling 151/Psych 156A:
Acquisition of Language II

Lecture 15

Syntax I

Announcements

HW5 due today at 2:50pm

Be working on HW6 (due: 2/26/18)

Review questions available for syntax & sentence pragmatics

Pronouns in context

syntax, semantics

her



another one



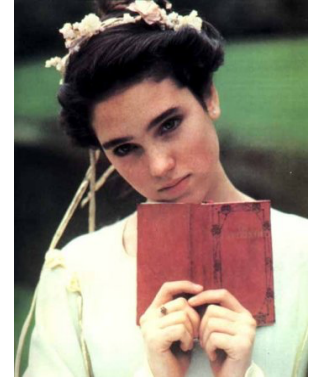
Pronouns in context

she can be *Sarah* in all of these:

Sarah ate the peach while *she* was reading.

While *she* was reading, *Sarah* ate the peach.

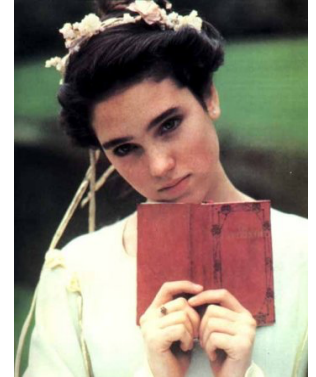
While *Sarah* was reading, *she* ate the peach.



but in “*She* ate the peach while *Sarah* was reading”, *she* \neq *Sarah*

Pronouns in context

Pronouns are energy-saving devices that allow us to refer to someone or something (whose identity we know) without using a name (like “Sarah” or “Jareth”) or other noun phrase (like “the girl” or “a very impressive goblin king”).



Sarah thought that **she** could save her brother.

Jareth was surprised **the girl** summoned **him**, and resolved to show **her** **he** was a very impressive goblin king.



Pronouns

<http://www.thelingspace.com/episode-40>

https://www.youtube.com/watch?v=9sqm_cex4kA

1:18 - 2:24

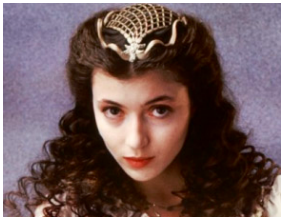


Pronouns in context

Reflexive pronouns behave differently than regular pronouns:
they're interpreted differently

What's the antecedent of this pronoun?
???

Lily, who adores Sarah, admired herself in the mirror.

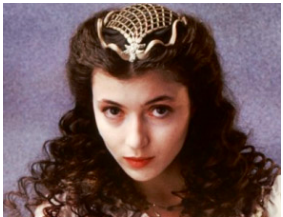


Lily, who adores Sarah, admired her in the mirror.

Pronouns in context

Reflexive pronouns behave differently than regular pronouns:
they're interpreted differently

Lily, who adores Sarah, admired herself in the mirror.



What's the antecedent of this pronoun?
???

Lily, who adores Sarah, admired her in the mirror.

Pronouns in context

Reflexive pronouns behave differently than regular pronouns:
they're interpreted differently

Lily, who adores Sarah, admired herself in the mirror.



Lily, who adores Sarah, admired her in the mirror.



Pronouns in context

Rule: **Reflexive pronouns** must refer to a noun phrase inside the same clause while **regular pronouns** must not.

main clause

Lily admired **herself** in the mirror.

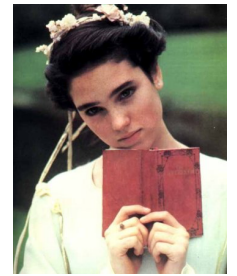
Lily, who adores **Sarah**, admired **herself** in the mirror.



main clause

Lily admired **her** in the mirror.

Lily, who adores **Sarah**, admired **her** in the mirror.



Pronouns

<http://www.thelingspace.com/episode-40>

https://www.youtube.com/watch?v=9sqm_cex4kA

2:24 - 3:24, 6:24 - 7:20



Pronouns in context

Rule: **Reflexive pronouns** must refer to a noun phrase inside the **same clause** while **regular pronouns** must not.

Antecedent for **reflexive pronoun** = **same clause**

Antecedent for **regular pronoun** = **not same clause**

Suppose children already know this rule — do they have all they need to know?

No! They still need to figure out which words belong to which pronoun classes.

herself

her

????



Pronouns in context

Rule: **Reflexive pronouns** must refer to a noun phrase inside the **same clause** while **regular pronouns** must not.

Antecedent for **reflexive pronoun** = **same clause**

Antecedent for **regular pronoun** = **not same clause**

They still need to figure out which words belong to which pronoun classes.

Lily, who adores **Sarah**, admired **PRONOUN** in the mirror.



????

Pronouns in context

Rule: **Reflexive pronouns** must refer to a noun phrase inside the **same clause** while **regular pronouns** must not.

Antecedent for **reflexive pronoun** = **same clause**

Antecedent for **regular pronoun** = **not same clause**

But to do that, they need to know what its antecedent is...

Lily, who adores **Sarah**, admired **PRONOUN** in the mirror.

????

????



Pronouns in context

Rule: **Reflexive pronouns** must refer to a noun phrase inside the **same clause** while **regular pronouns** must not.

Antecedent for **reflexive pronoun** = **same clause**

Antecedent for **regular pronoun** = **not same clause**

How can they figure this out?

Lily, who adores **Sarah**, admired **PRONOUN** in the mirror.

????

????



Pronouns in context

Lily, who adores Sarah, admired PRONOUN in the mirror.
???? ?????



Orita, McKeown, Feldman, Lidz, & Boyd-Graber 2013

Maybe children can use the **discourse context** to figure out what the pronoun's antecedent is. From that, they can then figure out which type of pronoun it is.

Pronouns in context

Lily, who adores Sarah, admired PRONOUN in the mirror.
???? ?????



Context: Lily gazes at herself in the mirror a lot.

Orita, McKeown, Feldman, Lidz, & Boyd-Graber 2013

Maybe children can use the discourse context to figure out what the pronoun's antecedent is. From that, they can then figure out which type of pronoun it is.

Pronouns in context

Lily, who adores Sarah, admired PRONOUN in the mirror.
???? ?????



Orita, McKeown, Feldman, Lidz, & Boyd-Graber 2013

A computational-level modeled learner was able to use these discourse cues and knowledge of the distributional patterns of pronoun classes to infer which pronouns belong to which classes.



+

reflexive pronoun = same clause
regular pronoun = not same clause



herself
himself
itself

=

her
him
it

Pronouns in context

syntax, semantics

her



another one

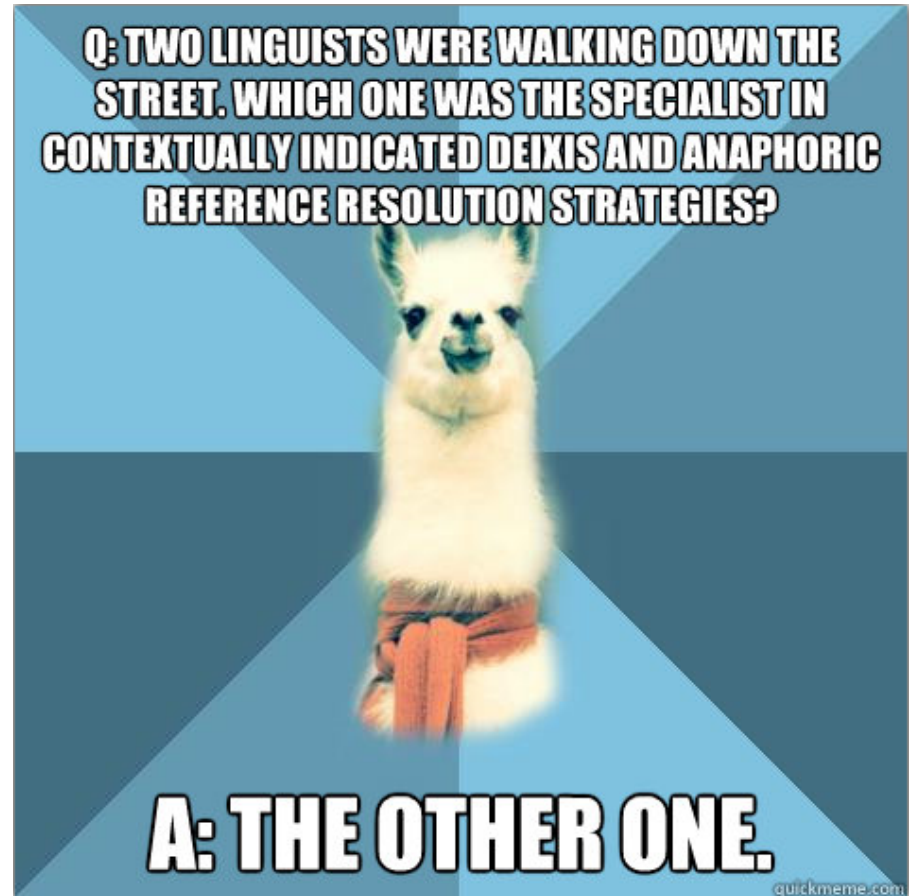


Pronouns in context

another one



Pronouns are sometimes called “anaphors”, and so interpreting them in context is sometimes known as “anaphora resolution”



Pronoun interpretation

syntax, semantics

another one

“Oh look — a pretty kitty!”



“Look — there’s another *one*!”



Pronoun interpretation

syntax, semantics

another one

antecedent

“Oh look — a pretty kitty!”



“Look — there’s another one!”

Interpretation: another pretty kitty

same
syntactic category
as antecedent

???

Pronoun interpretation

syntax, semantics

another one

antecedent

“Oh look — a pretty kitty!”



“Look — there’s another one!”

Interpretation: another

same
syntactic category
as antecedent

???

bigger than a plain **Noun**

Noun

|
pretty **kitty**

Pronoun interpretation

syntax, semantics

another *one*

antecedent

“Oh look — a pretty kitty!”



“Look — there’s another *one*!”

Interpretation: another ~~the~~ pretty kitty

same
syntactic category
as antecedent

???

smaller than a full **Noun Phrase**

Noun Phrase

the

Noun

pretty kitty

Pronoun interpretation

syntax, semantics

another *one*

antecedent

“Oh look — a pretty kitty!”



“Look — there’s another *one*!”

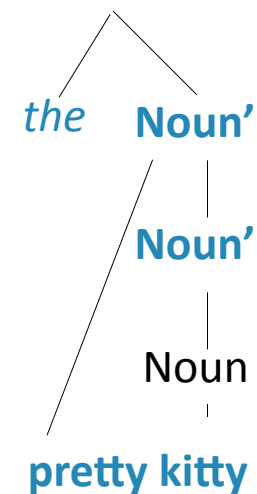
Interpretation: another

same
syntactic category
as antecedent

???

In-between category **Noun'**
that includes strings with nouns
and modifiers+nouns

Noun Phrase



Pronoun interpretation

syntax, semantics

another *one*

antecedent

“Oh look — a pretty **kitty!**”

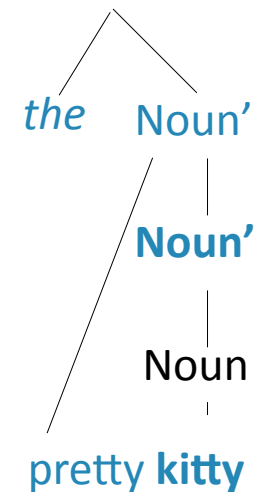


“Look — there’s another **one!**”

Interpretation: another

same
syntactic category
as antecedent

Noun Phrase



This is why we can also interpret **one** as just **kitty**.



Pronoun interpretation

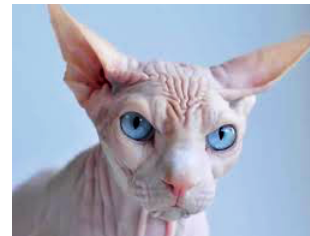
syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“Do you see another *one*?”



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

*Note: They did this with colored
bottles rather than kitties.*

Pronoun interpretation

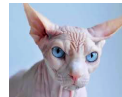
syntax, semantics

another one

“Oh look — a pretty kitty!”



“Do you see another *one*?”



Lidz, Waxman, & Freedman 2003:
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Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”

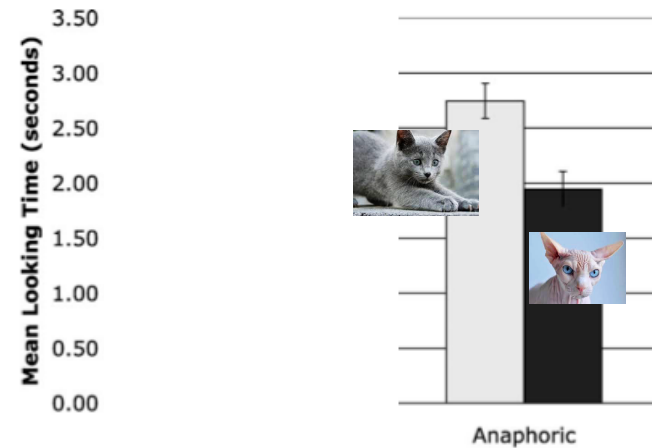


“Do you see another *one*?”

pretty kitty
Noun'



J. Lidz et al. / Cognition 89 (2003) B65–B73



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“What do you see now?”



another *one*
pretty kitty
Noun'



Lidz, Waxman, & Freedman 2003:
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Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“What do you see now?”



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syntax, semantics

another *one*

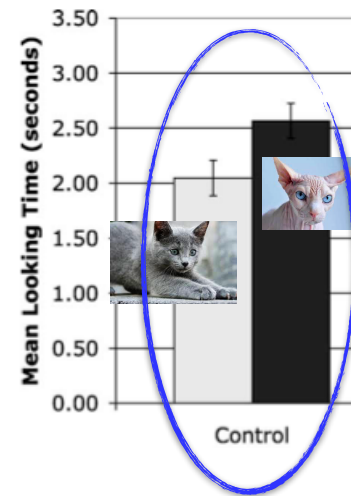
“Oh look — a pretty kitty!”



Shows baseline looking preference

J. Lidz et al. / Cognition 89 (2003) B65–B73

“What do you see now?”



another *one*
pretty kitty
Noun'



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

syntax, semantics

another one

“Oh look — a pretty kitty!”

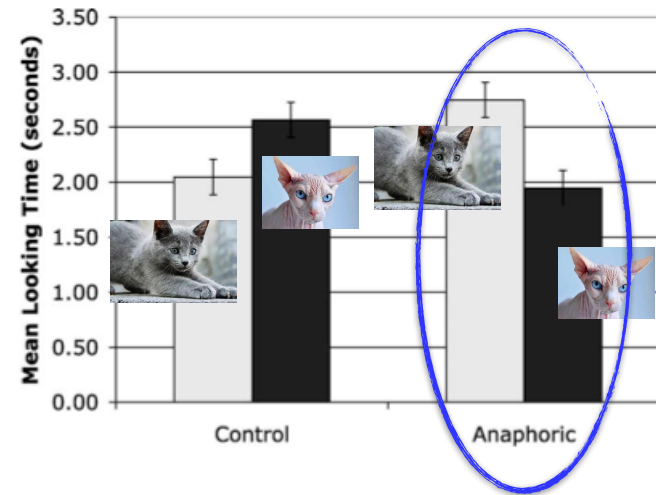


Shows baseline looking preference

which is different than “Do you see another one?”

J. Lidz et al. / Cognition 89 (2003) B65–B73

“What do you see now?”



another one
pretty kitty
Noun'



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“Do you see another kitty?”



another *one*
pretty kitty
Noun’



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“Do you see another kitty?”



another *one*
pretty kitty
Noun'



Lidz, Waxman, & Freedman 2003:
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Pronoun interpretation

syntax, semantics

another *one*

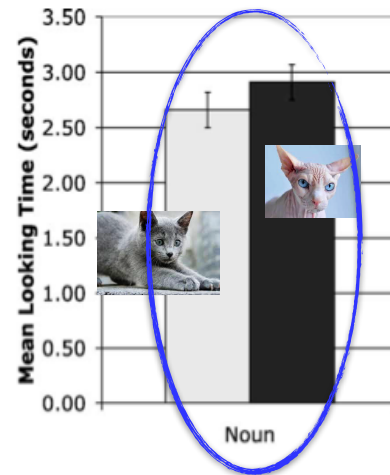
“Oh look — a pretty kitty!”



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J. Lidz et al. / Cognition 89 (2003) B65–B73

“Do you see another kitty?”



another *one*
pretty kitty
Noun'



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“Do you see another pretty kitty?”



another *one*
pretty kitty
Noun'



Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

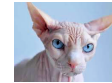
syntax, semantics

another *one*

“Oh look — a pretty kitty!”



“Do you see another pretty kitty?”



another *one*
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Noun'



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Pronoun interpretation

syntax, semantics

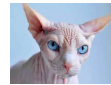
another one

“Oh look — a pretty kitty!”

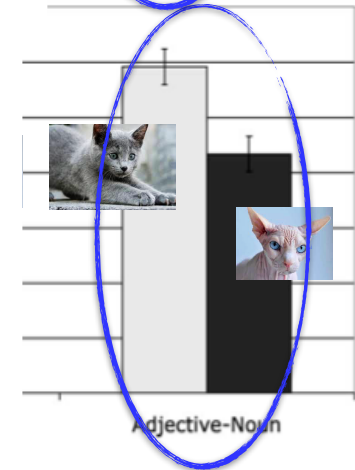
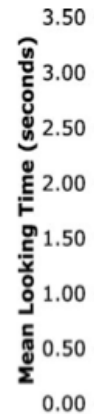
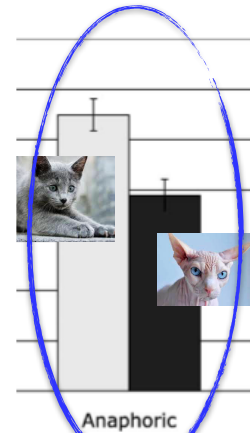
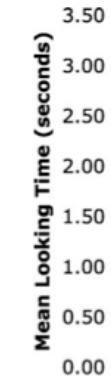


Same looking pattern as “another one”

“Do you see another pretty kitty?”



another one
pretty kitty
Noun’



J. Lidz et al. / Cognition 89 (2003) B65–B73

Lidz, Waxman, & Freedman 2003:
18-month-old interpretations

Pronoun interpretation

syntax, semantics

another *one*

“Oh look — a pretty kitty!”



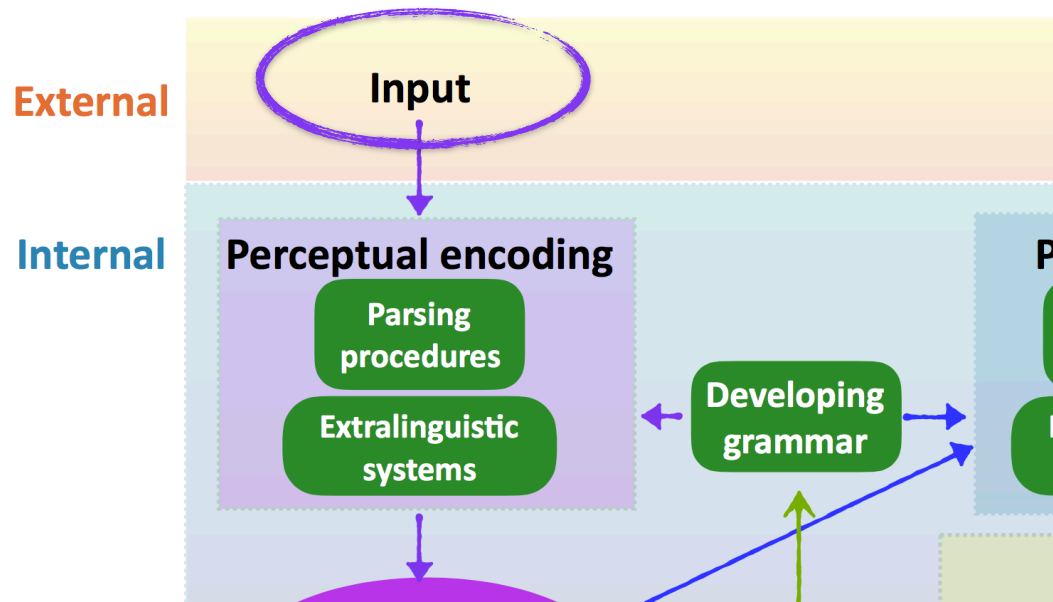
Noun'
pretty kitty

“Do you see another *one*?”



Several learning strategies implemented with **algorithmic-level** modeled learners, given **realistic** samples of English child-directed speech.

Pearl & Mis 2016



Pronoun interpretation

syntax, semantics

another one



Noun'
pretty kitty

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

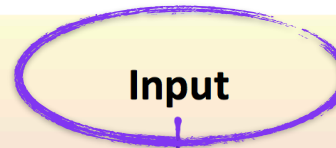
Syntactically (SYN) ambiguous data

(92% according to corpus study by Pearl & Mis 2011, 2016):

“Look – a kitty! Oh, look – another one.”



External



Internal

Perceptual encoding

Parsing procedures

Extralinguistic systems

Developing grammar

P

P

P

Pronoun interpretation

syntax, semantics

another *one*



Noun'
pretty kitty

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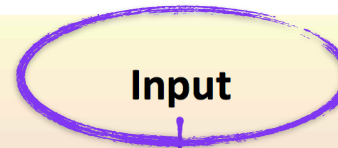


Antecedent = “kitty”

Referent



External



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P

P

P

P

Pronoun interpretation

syntax, semantics

another one



Noun'
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Referent

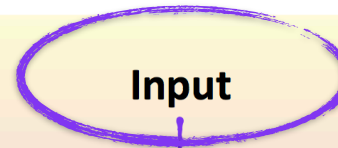


Syntactic category?

Noun'
???

Noun
kitty

External



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P

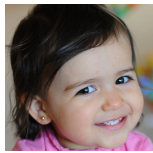
P

P

Pronoun interpretation

syntax, semantics

another one



92% SYN ambiguous

Noun'
pretty kitty

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

Referentially and syntactically (REF-SYN) ambiguous

(8% according to corpus study by Pearl & Mis 2011, 2016)

“Look – a pretty kitty! Oh, look – another one.”



External

Input

Internal

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P

Pronoun interpretation

syntax, semantics

another *one*



Noun'
pretty kitty

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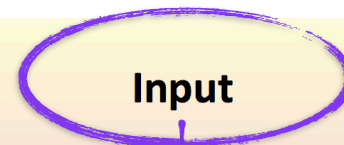
“Look – a pretty **kitty!** Oh, look – another **one.**”



Referent



External



Internal

Perceptual encoding

Parsing
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Extralinguistic

Developing



Pronoun interpretation

syntax, semantics

another *one*



Noun'
pretty kitty

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“Look – a **pretty kitty!** Oh, look – another **one.**”

Antecedent = “pretty kitty”

OR

Antecedent = “kitty”

Referent



External

Input

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Pronoun interpretation

syntax, semantics

another *one*



Noun'
pretty kitty

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“Look – a pretty kitty! Oh, look – another one.”

Antecedent = “pretty kitty”

???

Antecedent = “kitty”

Referent



Syntactic category?

???

Noun'

—

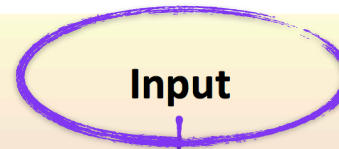
Noun

—

kitty



External



Internal

Perceptual encoding

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Pronoun interpretation

syntax, semantics

another *one*



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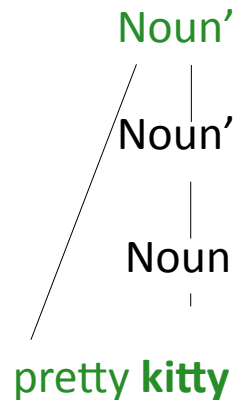
“Look – a pretty kitty! Oh, look – another one.”

Antecedent = “pretty kitty”

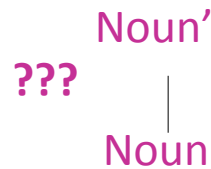
???

Antecedent = “kitty”

Referent



Syntactic category?



External

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Perceptual encoding

Parsing

Pronoun interpretation

syntax, semantics

another one



Noun'

pretty kitty



92% SYN ambiguous

8% REF-SYN ambiguous

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

Unambiguous (UNAMB) data

What we wish were there but isn't

(0% according to corpus study by Pearl & Mis 2011, 2016)

"Look – a pretty kitty!

Hmmm - there doesn't seem to be another one here, though."



External

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De

Pronoun interpretation

syntax, semantics

another *one*



Noun'

pretty kitty



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What we wish were there but isn't

(0% according to corpus study by Pearl & Mis 2011, 2016)

"Look – a pretty **kitty**!

Hmmm - there doesn't seem to be another **one** here, though."

Can't have "**kitty**" as its antecedent, because there *is* another kitty here. This would be a false thing to say.

~~kitty~~



External

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Perceptual encoding

Parsing procedures

Extralinguistic

D

Pronoun interpretation

syntax, semantics

another *one*



Noun'

pretty kitty



Referent

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English child-directed speech

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Unambiguous (UNAMB) data

What we wish were there but isn't

(0% according to corpus study by Pearl & Mis 2011, 2016)

“Look – a **pretty kitty!**

Must have “pretty kitty” as its antecedent.

Hmmm - there doesn't seem to be another **one** here, though.”



External

Input

Internal

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Parsing procedures

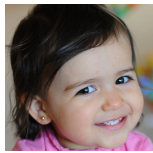
Extralinguistic

De

Pronoun interpretation

syntax, semantics

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Referent

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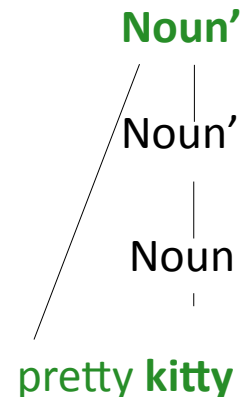
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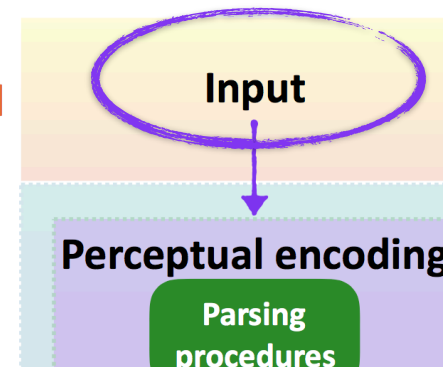
Must have “pretty kitty” as its antecedent.



and be a Noun' category.

External

Internal



Pronoun interpretation

syntax, semantics

another *one*



English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

92% SYN ambiguous

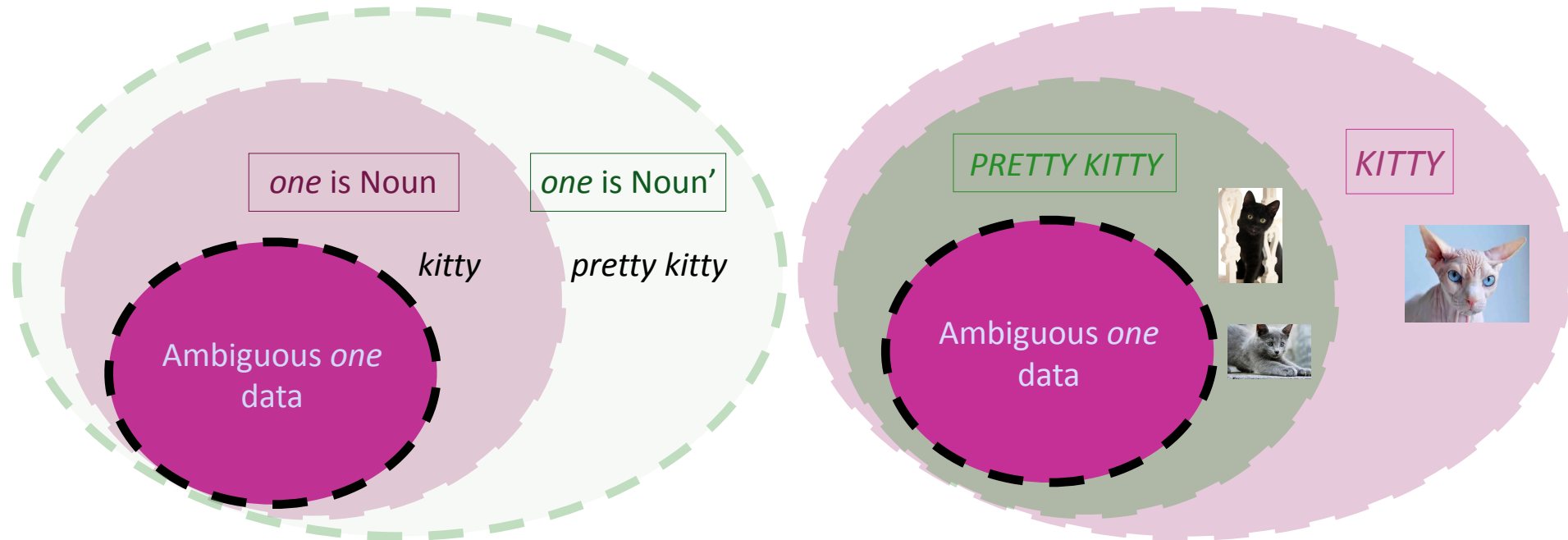
8% REF-SYN ambiguous

Noun'
pretty kitty

How do children learn the right generalizations for interpreting *one*?

syntactic category

referent in context



Pronoun interpretation

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

syntax, semantics

another *one*

92% SYN ambiguous

8% REF-SYN ambiguous



Noun'
pretty kitty



How do children learn the right generalizations for interpreting *one*?

Regier & Gahl (2004), Pearl & Lidz (2009):
Filtering the direct evidence (being more selective about what you learn from) & learning from it in more sophisticated ways

Pearl & Mis (2016): **Leveraging a broader set of data** to learn from & learning from it more sophisticated ways



Pronoun interpretation

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

syntax, semantics

another *one*

92% SYN ambiguous

8% REF-SYN ambiguous



Noun'
pretty kitty



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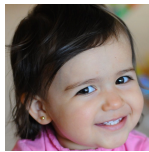
syntax, semantics

another *one*

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Noun'
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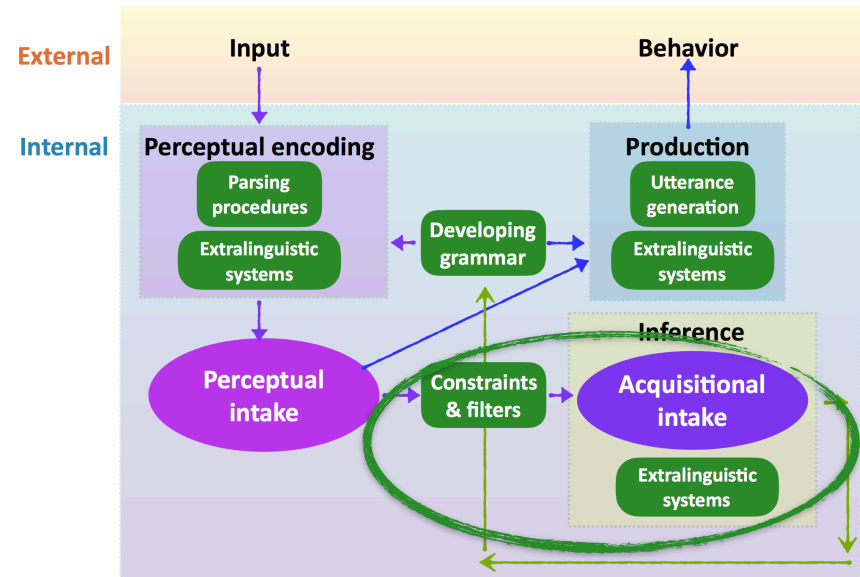
Filtering the direct evidence

Pearl & Mis (2016):

Leveraging a broader set of data

Learning from it in more sophisticated ways

Probabilistic reasoning about input:
Bayesian inference



Pronoun interpretation

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

syntax, semantics

another *one*

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Noun'
pretty kitty



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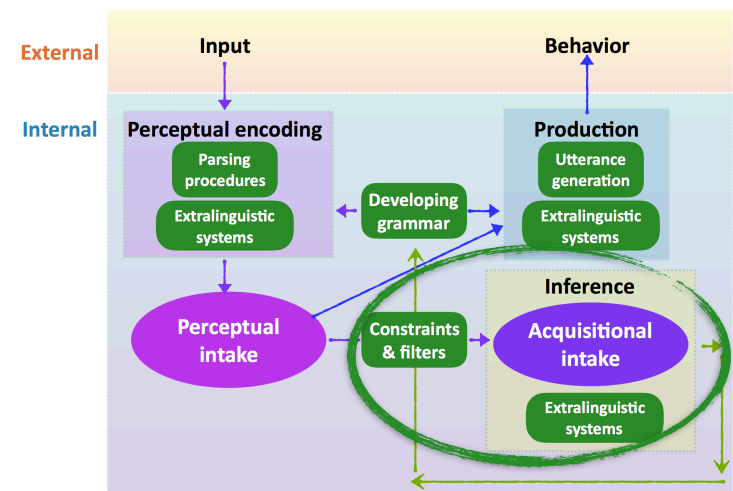
Pearl & Mis (2016):

Leveraging a broader set of data

Learning from it in more sophisticated ways

Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence



Pronoun interpretation

syntax, semantics

another *one*



English child-directed speech

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Noun'
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Pearl & Mis (2016):

Leveraging a broader set of data

Learning from it in more sophisticated ways

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Filtering the direct evidence

Ignore these data

92% SYN ambiguous

“Look – a **kitty!**

Oh, look – another **one.**”



Pronoun interpretation

syntax, semantics

another *one*



Noun'
pretty kitty

English child-directed speech

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Ignore these data

92% SYN ambiguous

“Look – a **pretty kitty!**
Oh, look – another **one.**”



**and learn from these data
using Bayesian inference**

8% REF-SYN ambiguous

Pronoun interpretation

English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

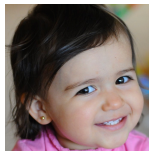
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Noun'
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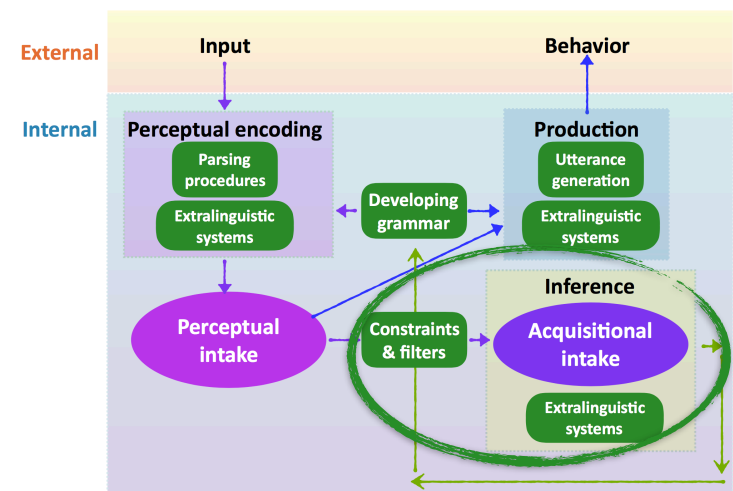
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Pronoun interpretation

syntax, semantics

another *one*



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Noun'

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How do children learn the right generalizations for interpreting *one*?

Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data

Learn from data like these that involve other pronouns

“Look – a pretty kitty!

I want to pet *it*.”



Pronoun interpretation

syntax, semantics

another *one*



English child-directed speech

Problem: Most direct evidence children encounter is ambiguous.

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Noun'

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Filtering the direct evidence

Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data

Learn from data like these that involve other pronouns

“Look – a pretty kitty!

I want to pet *it*.”



Key: modifier is included in antecedent.
Implication: May want to include the modifier whenever it's an option.

one
pretty kitty

Pronoun interpretation

syntax, semantics

another one



Noun'

pretty kitty



Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

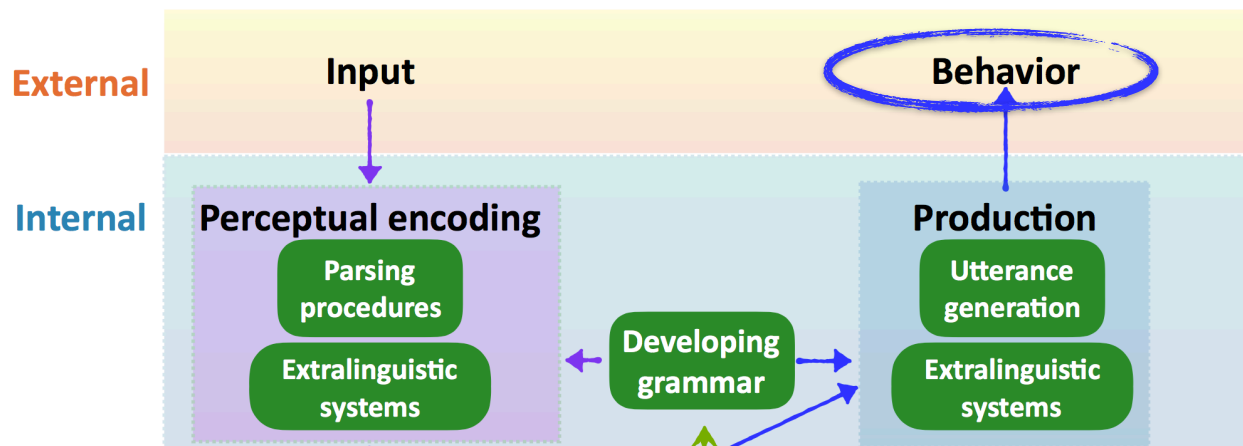
Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data

Algorithmic-level implementation of these strategies

Evaluated on whether they matched
18-month-old looking preferences.



Pronoun interpretation

syntax, semantics

another one



Noun'

pretty kitty



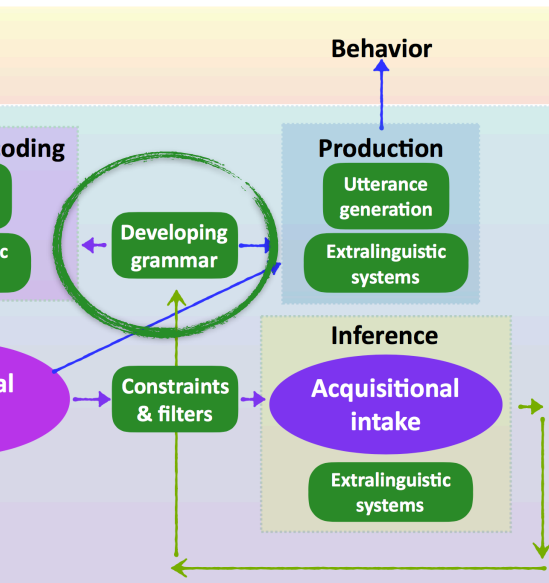
Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data



Algorithmic-level

Both were successful at generating the 18-month-old behavior. We can then look inside the modeled learners and see what the underlying representations were.



Pronoun interpretation

syntax, semantics

another one



Noun'
pretty kitty



Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data



Algorithmic-level

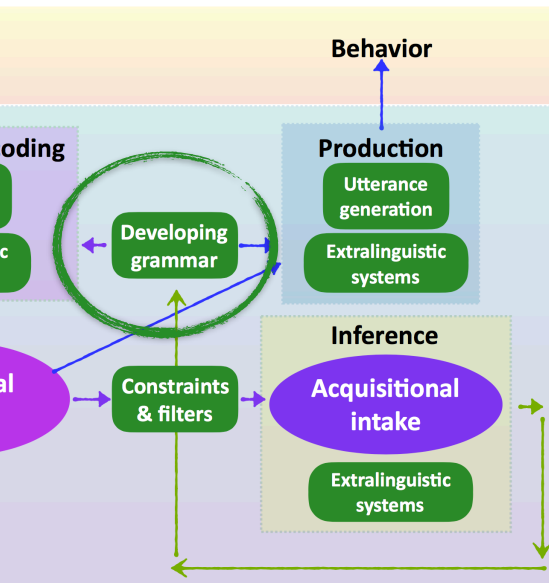
Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

Adult representations

✓ Noun'
pretty kitty

But...required additional situational context to be present to succeed.



Pronoun interpretation

syntax, semantics

another one



Noun'
pretty kitty



Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data

Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

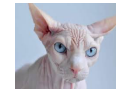
“Look – a pretty kitty!”

Oh, look – another one.”

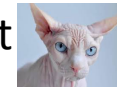
Adult representations

Noun'
pretty kitty

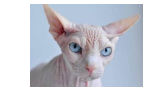
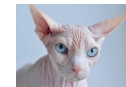
small



furry



light-eyed

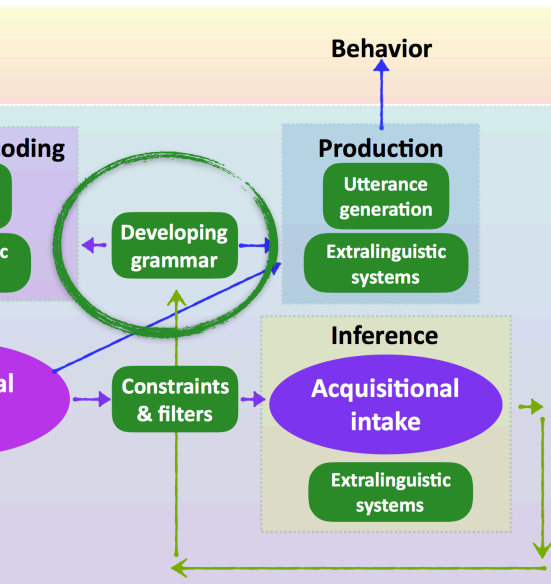


big-eared

But...required additional situational context to be present to succeed.

Needed to have a lot of alternative options so it's a suspicious coincidence that the referent is pretty if "pretty" wasn't actually included in the antecedent.

Algorithmic-level



Pronoun interpretation

syntax, semantics

another *one*



Noun'

pretty kitty

Needed to have a lot of alternative options so it's a suspicious coincidence that the referent is pretty if "pretty" wasn't actually included in the antecedent.

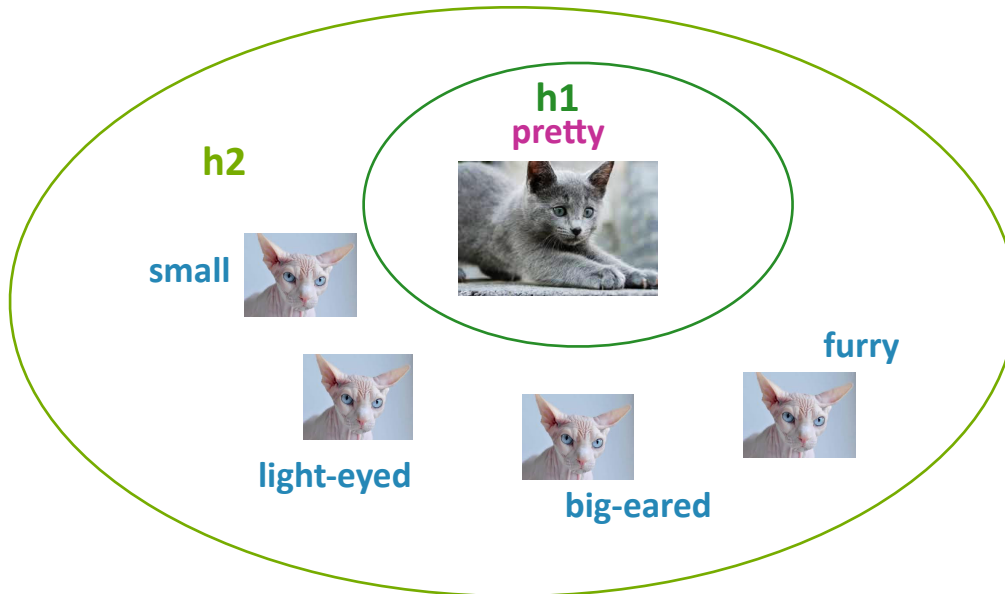


"Look – a **pretty kitty!**
Oh, look – another **one.**"

$$P(h|D) \propto P(D|h) * P(h)$$

h1 = antecedent is "pretty kitty"

h2 = antecedent is "kitty"



Pronoun interpretation

syntax, semantics

another one



Noun'

pretty kitty

Needed to have a lot of alternative options so it's a suspicious coincidence that the referent is pretty if "pretty" wasn't actually included in the antecedent.



"Look – a **pretty kitty!**
Oh, look – another **one.**"

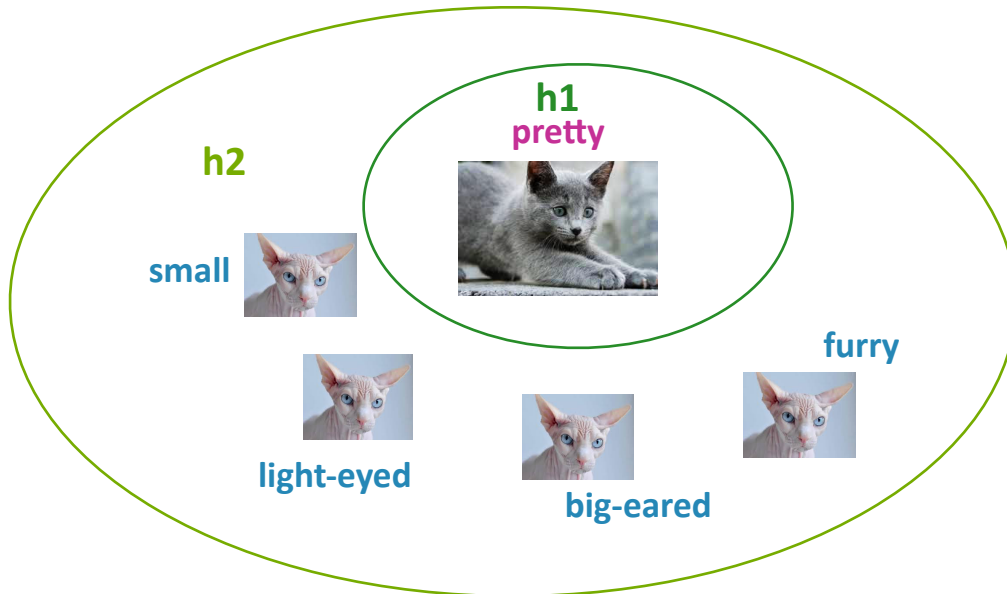
$$P(h|D) \propto P(D|h) * P(h)$$

h1 = antecedent is "pretty kitty"

h2 = antecedent is "kitty"

$$P(h1) = 1/2$$

$$P(h2) = 1/2$$



Pronoun interpretation

syntax, semantics

another one



Noun'

pretty kitty

Needed to have a lot of alternative options so it's a suspicious coincidence that the referent is pretty if "pretty" wasn't actually included in the antecedent.



"Look – a **pretty kitty!**
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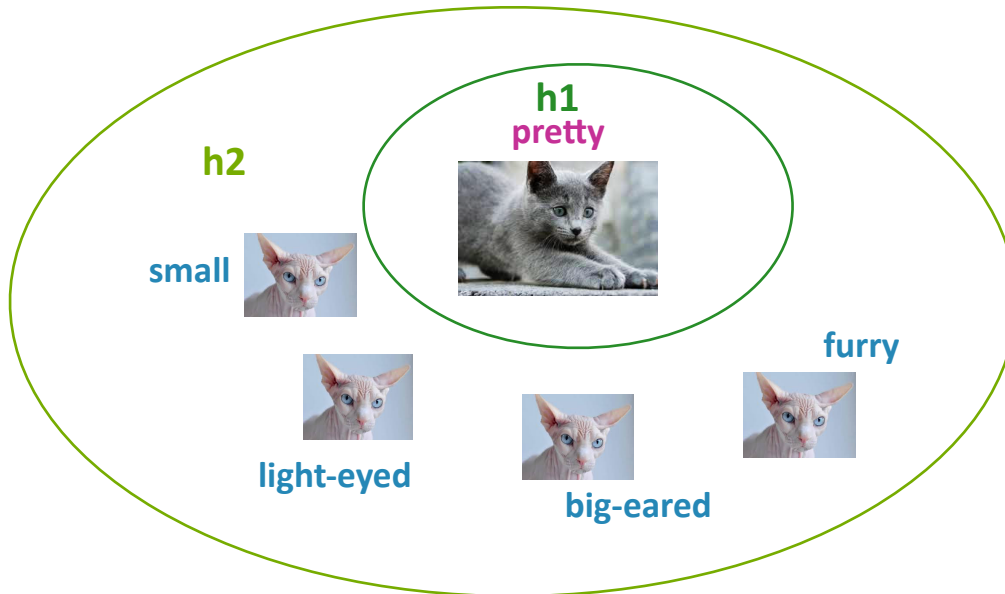
$$P(h|D) \propto P(D|h) * P(h)$$

h1 = antecedent is "pretty kitty"

h2 = antecedent is "kitty"

$$P(D | h1) = 1/1 \quad P(h1) = 1/2$$

$$P(D | h2) = 1/5 \quad P(h2) = 1/2$$



Pronoun interpretation

syntax, semantics

another *one*



Noun'

pretty kitty

Needed to have a lot of alternative options so it's a suspicious coincidence that the referent is pretty if "pretty" wasn't actually included in the antecedent.

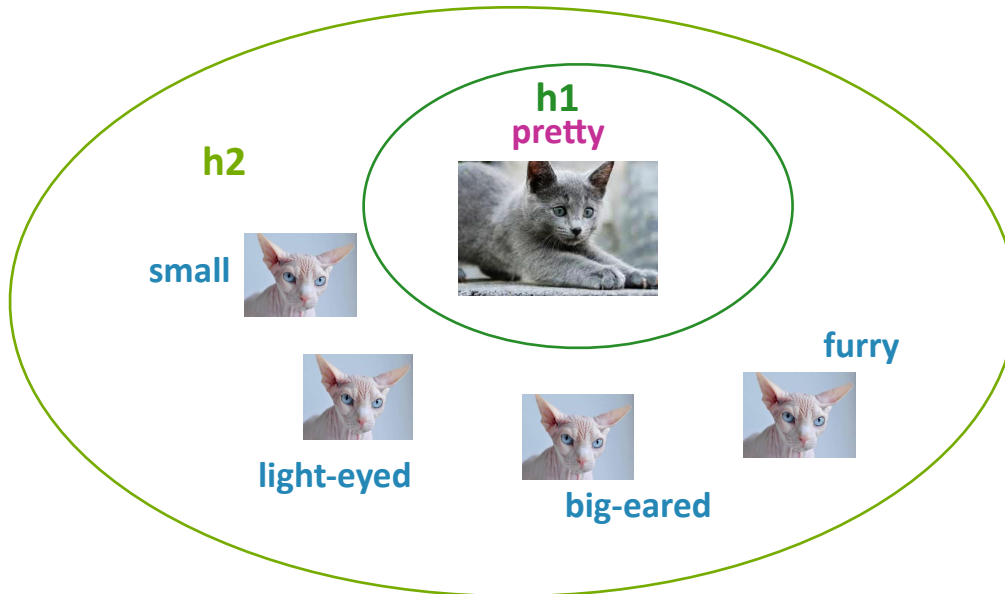


"Look – a **pretty kitty!**
Oh, look – another **one.**"

$$P(h|D) \propto P(D|h) * P(h)$$

h1 = antecedent is "**pretty kitty**"

h2 = antecedent is "**kitty**"



$$P(D | h1) = 1/1 \quad P(h1) = 1/2$$

$$P(D | h2) = 1/5 \quad P(h2) = 1/2$$

$$P(h1 | D) \propto 1/1 * 1/2 = 1/2$$

$$P(h2 | D) \propto 1/5 * 1/2 = 1/10$$

Pronoun interpretation

syntax, semantics

another one



Noun'
pretty kitty



Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data

Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

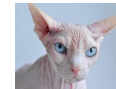
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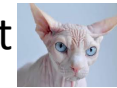
Adult representations

Noun'
pretty kitty

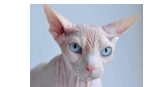
small



furry



light-eyed



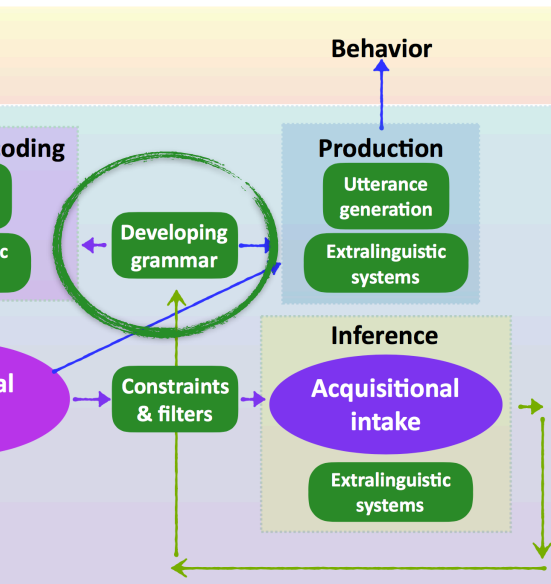
big-eared

But...required additional situational context to be present to succeed.

Less robust

Needed to have a lot of alternative options so it's a suspicious coincidence that the referent is pretty if "pretty" wasn't actually included in the antecedent.

Algorithmic-level



Pronoun interpretation

syntax, semantics

another *one*



Noun'
pretty kitty



Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence

✓ Less robust

Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data

Algorithmic-level

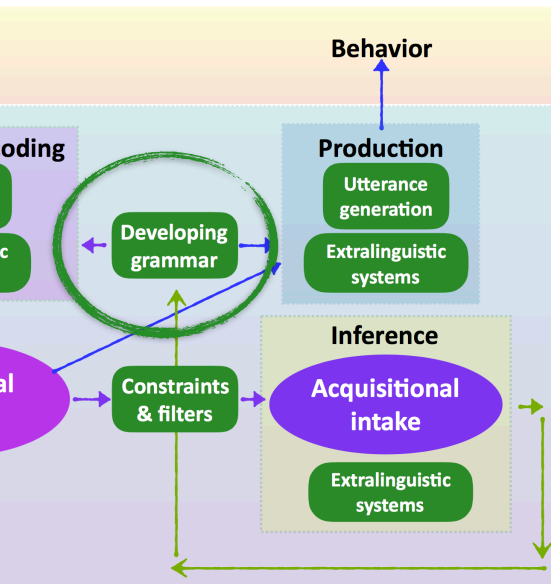
Immature representations

✓ Noun' only in certain linguistic contexts
pretty kitty



“Look – a pretty kitty!
Oh, look – another one.”

Noun'



Noun'
Noun'
Noun
pretty kitty

Pronoun interpretation

syntax, semantics

another one



Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence



Less robust

Learning from it in more sophisticated ways



Noun'
pretty kitty

Pearl & Mis (2016):

Leveraging a broader set of data

Noun

kitty

Immature representations



Noun'
pretty kitty

only in certain linguistic contexts



otherwise Noun

“Look – a **kitty!**

Oh, look – another **one.**”



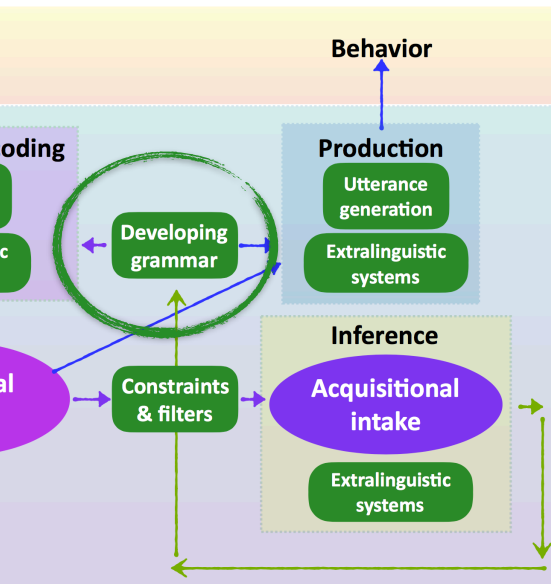
Noun



But...does this for pretty much any situational context.

More robust

Algorithmic-level



Pronoun interpretation

syntax, semantics

another one



Noun'
pretty kitty



Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence



Less robust

Learning from it in more sophisticated ways

Pearl & Mis (2016):



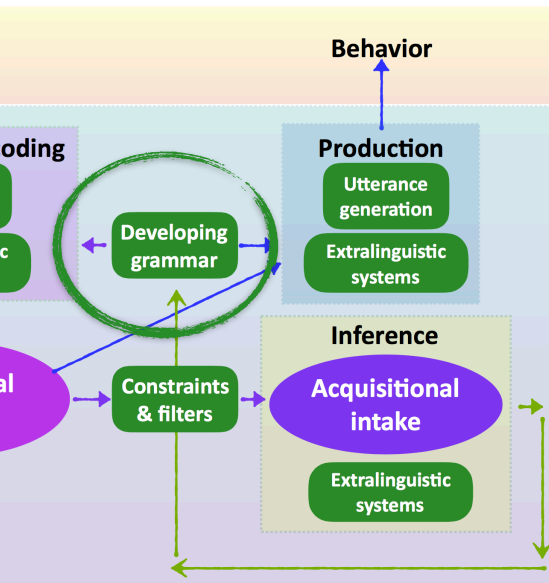
More robust

Leveraging a broader set of data

Algorithmic-level

By modeling, we have two concrete proposals for how children learn the knowledge they do by 18 months.

This also motivates future experimental work to distinguish these two possibilities.



Pronoun interpretation

syntax, semantics

another one



Noun'

pretty kitty



Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence



Less robust

Learning from it in more sophisticated ways

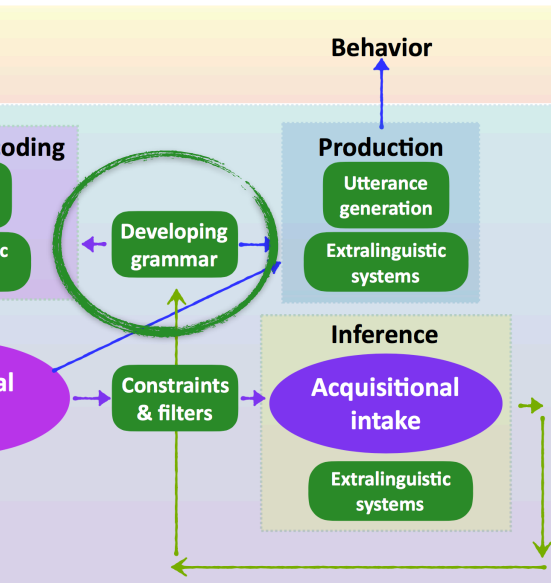
Pearl & Mis (2016):

Leveraging a broader set of data



More robust

Algorithmic-level



This also motivates future experimental work to distinguish these two possibilities.



“This kitty likes the **cup** of milk but not the **one** of water.”



Adults generally don't like this because it forces *one* to be category **Noun**.

Pronoun interpretation

syntax, semantics

another one

Regier & Gahl (2004), Pearl & Lidz (2009):

Filtering the direct evidence



Less robust

Learning from it in more sophisticated ways

Pearl & Mis (2016):

Leveraging a broader set of data



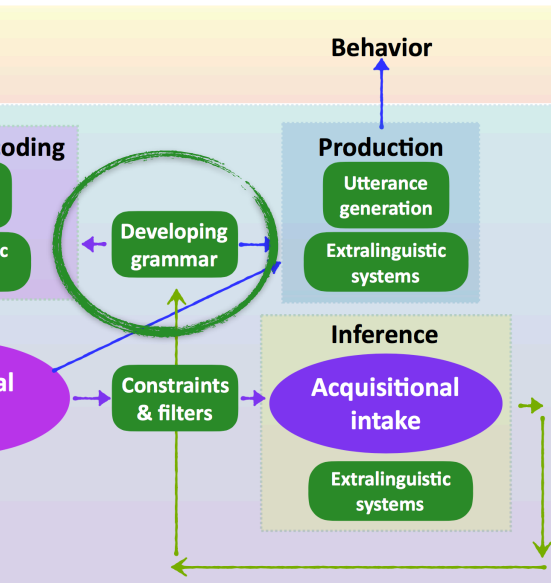
More robust

Noun'

pretty kitty



Algorithmic-level



This also motivates future experimental work to distinguish these two possibilities.



“This kitty likes the **cup** of milk but not the **one** of water.”

~~Noun~~

When do children have this same judgment? Is it before 18 months?

Pronoun interpretation

syntax, semantics

another one

Noun'
pretty kitty

Learning from it in more sophisticated ways

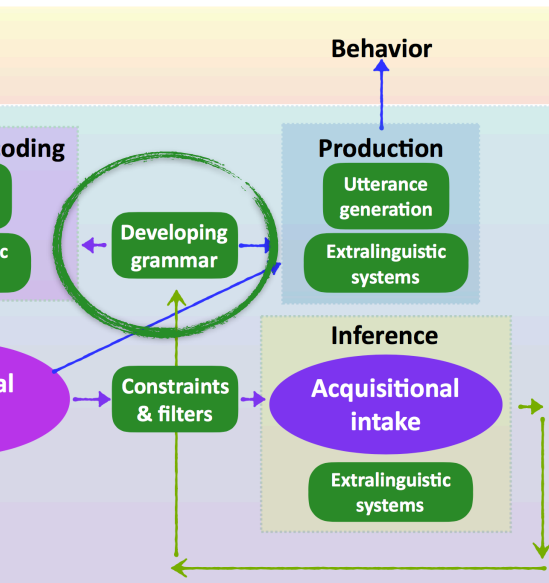
Pearl & Mis (2016):

Leveraging a broader set of data



More robust

Algorithmic-level



By 18 months

Regier & Gahl (2004),
Pearl & Lidz (2009):

Filtering the direct evidence



“This kitty likes the **cup** of milk but
not the **one** of water.”

~~Noun~~

When do children have this
same judgment? Is it before
18 months?

Pronoun interpretation

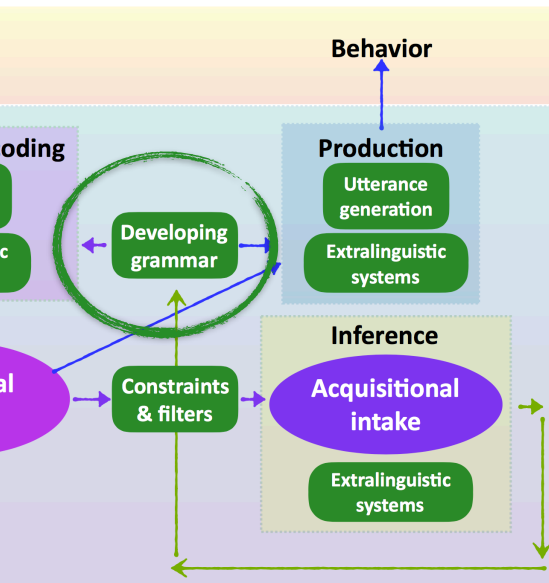
syntax, semantics

another one

Noun'
pretty kitty



Algorithmic-level



By 18 months

Regier & Gahl (2004),
Pearl & Lidz (2009):

Filtering the direct evidence



Not by 18 months

Pearl & Mis (2016):

Leveraging a broader set of data



“This kitty likes the **cup** of milk but
not the **one** of water.”

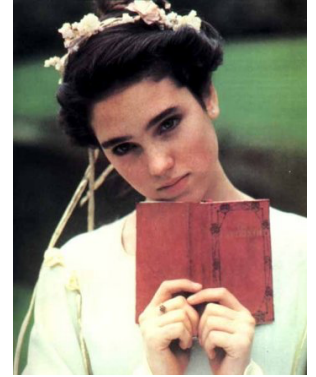
~~Noun~~

When do children have this
same judgment? Is it before
18 months?

Pronouns in context

her

- Interpreting pronouns involves figuring out their referents in context.
- One important factor is the syntactic constraints on where a pronoun's antecedent can be found and what category that antecedent can be.



- Other important factors include clues from the discourse context and from how other similar words are used
- Computational modeling can be used to figure out how children can use the input available to learn the knowledge they do about pronoun interpretation

another one



Questions?



You should be able to do up through question 1 on HW6 and up through question 9 on the syntax & sentences review questions.