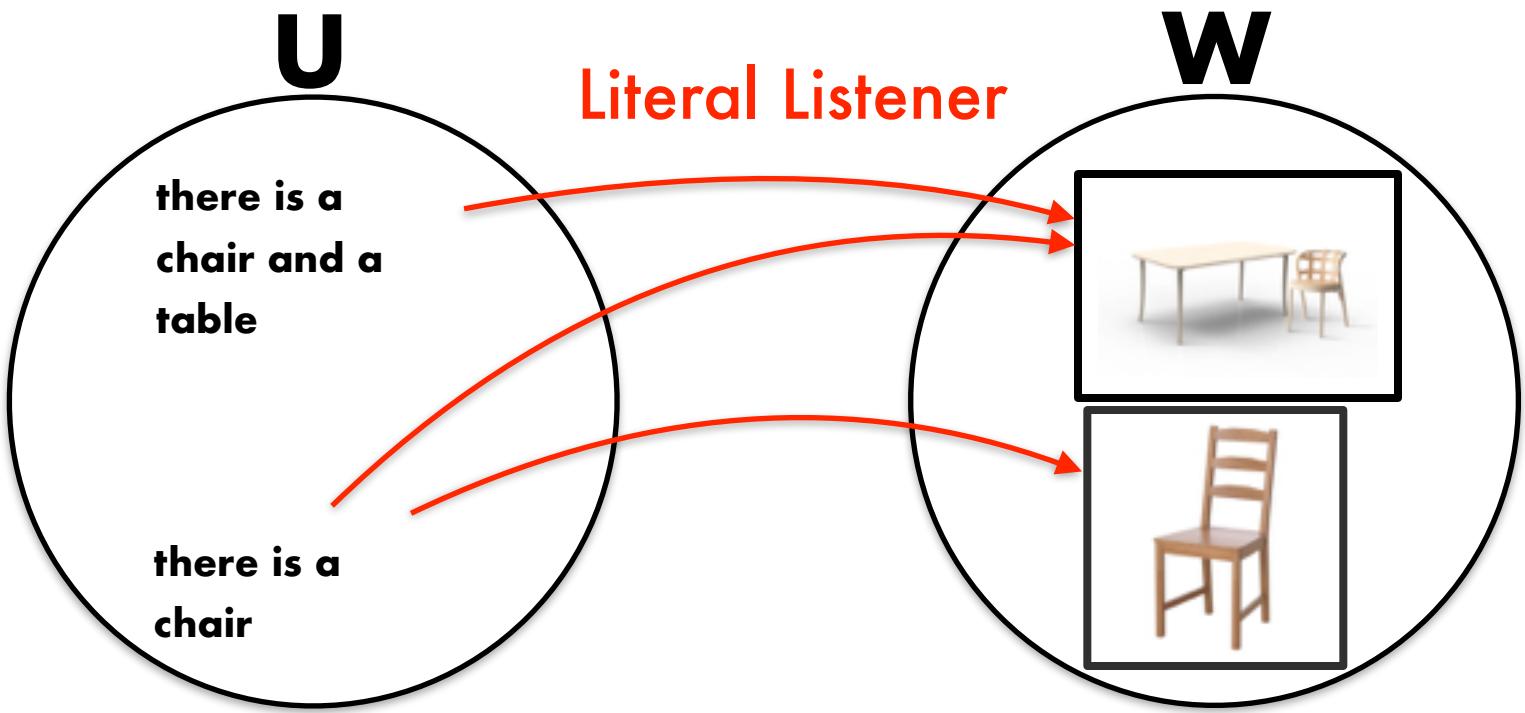
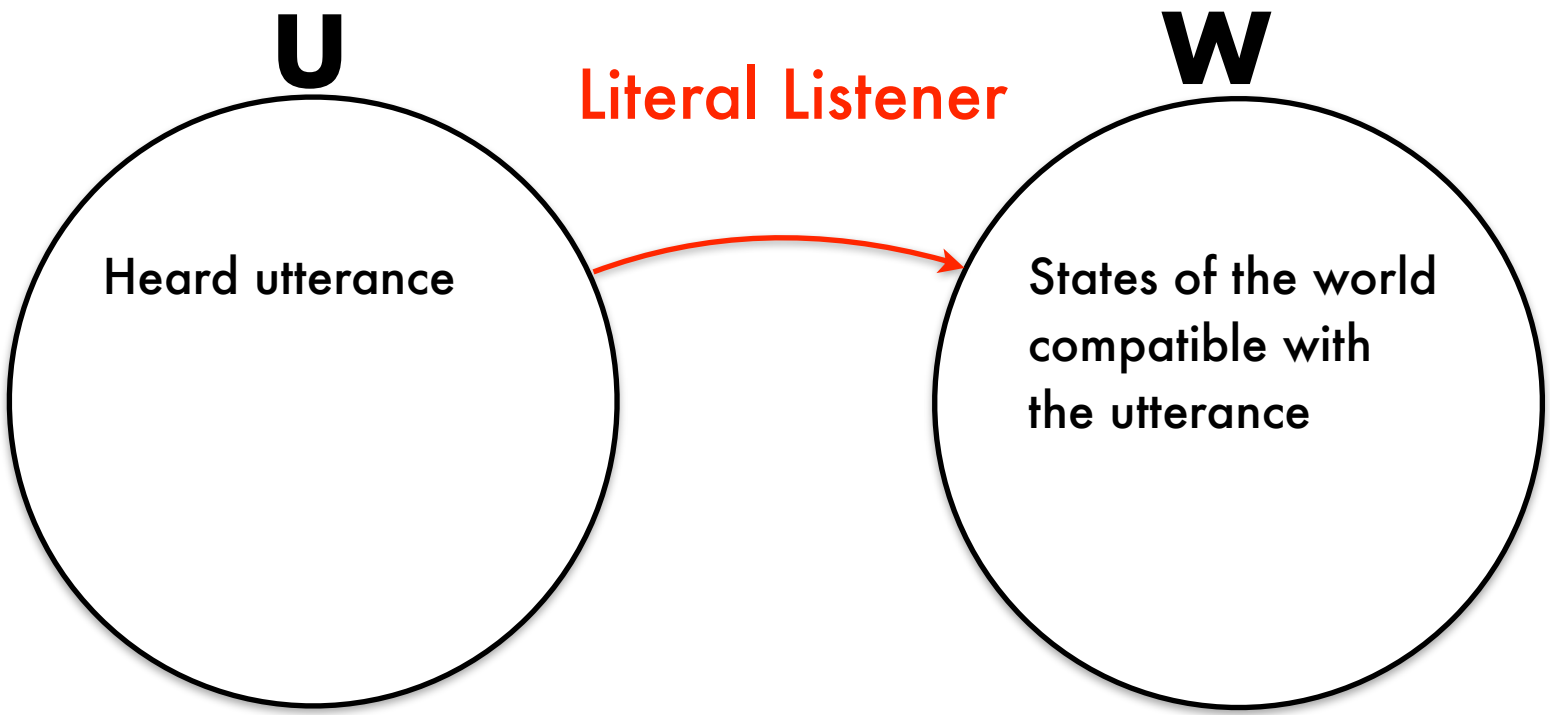
Bayesian Models of Social Meaning: Higher Order Indexes

Reuben Cohn-Gordon

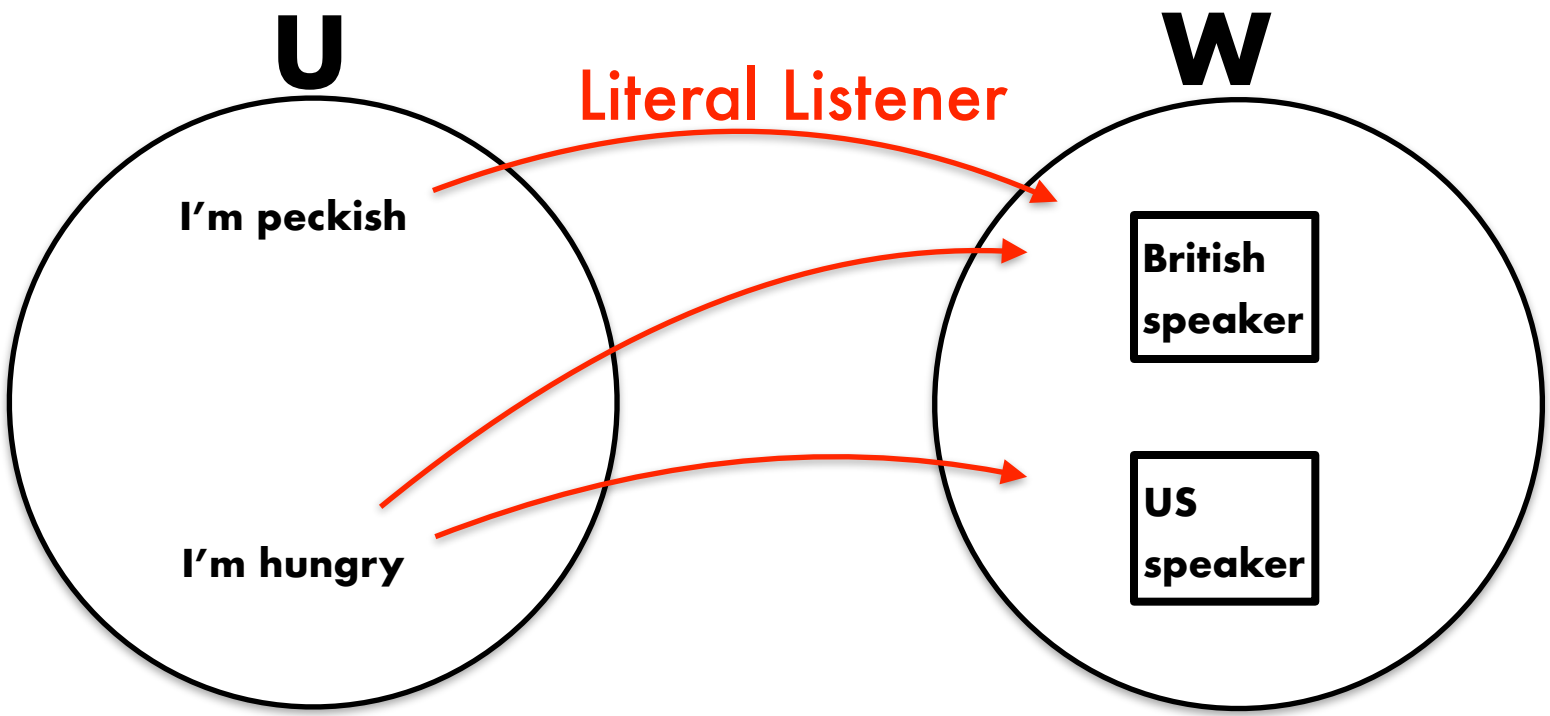
Truth-conditional meaning



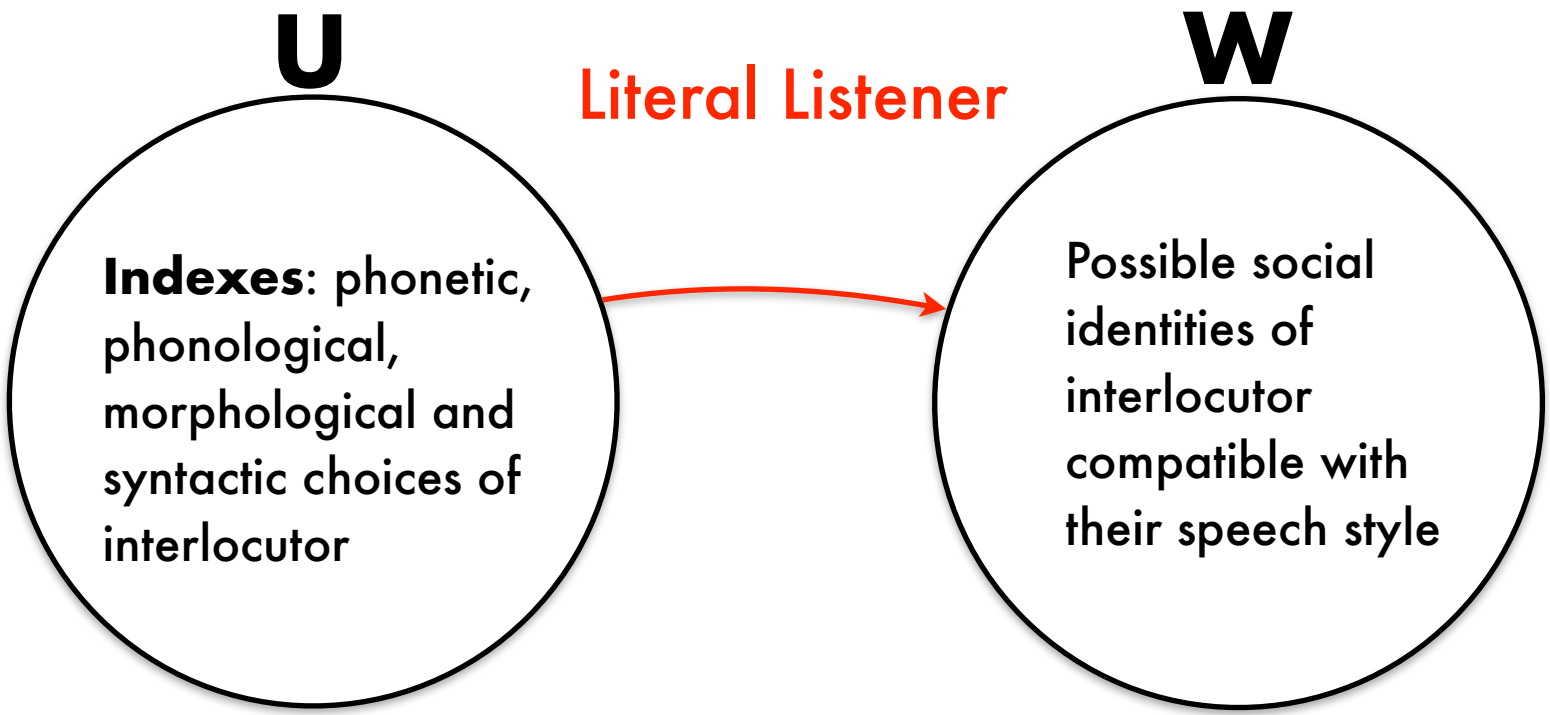
Literal Listener :: U → powerset(W)



Non-truth conditional meaning



Literal Listener :: U → powerset(W)



Social Meaning

What's an identity?

1st wave (e.g. Labov 1966): macrosocial categories

2nd wave (e.g. Rickford 1986): local categories

3rd wave (e.g. Zhang 2005): microsocial categories, stance

Social Meaning

(1) working (2) workin'

Truth-conditionally equivalent, socially distinct

Campbell-Kibler (2009): Listeners associate speakers of (1) with

- education, intelligence, articulateness, formality and distance
- an indexical field (Eckert 2008)

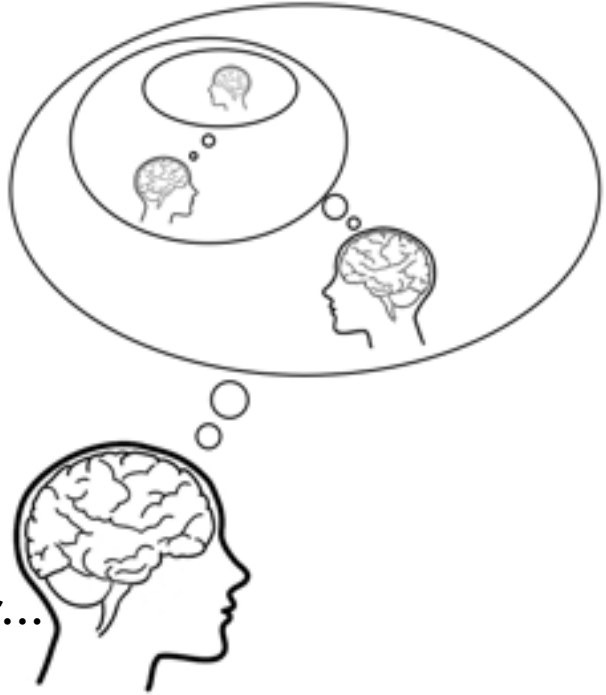
Higher-order indexes

- Variants can convey meanings they are not primarily/originally associated with
- Silverstein (2003)
- E.g., an adult can use childlike features to convey cuteness/innocence
- Without having it be inferred that they are a child

Overview

- Probabilistic models of semantics and pragmatics for sociolinguistics
- Extending and enriching this connection to **higher order indexes**
- Inspired by model of metaphor

Probabilistic Models



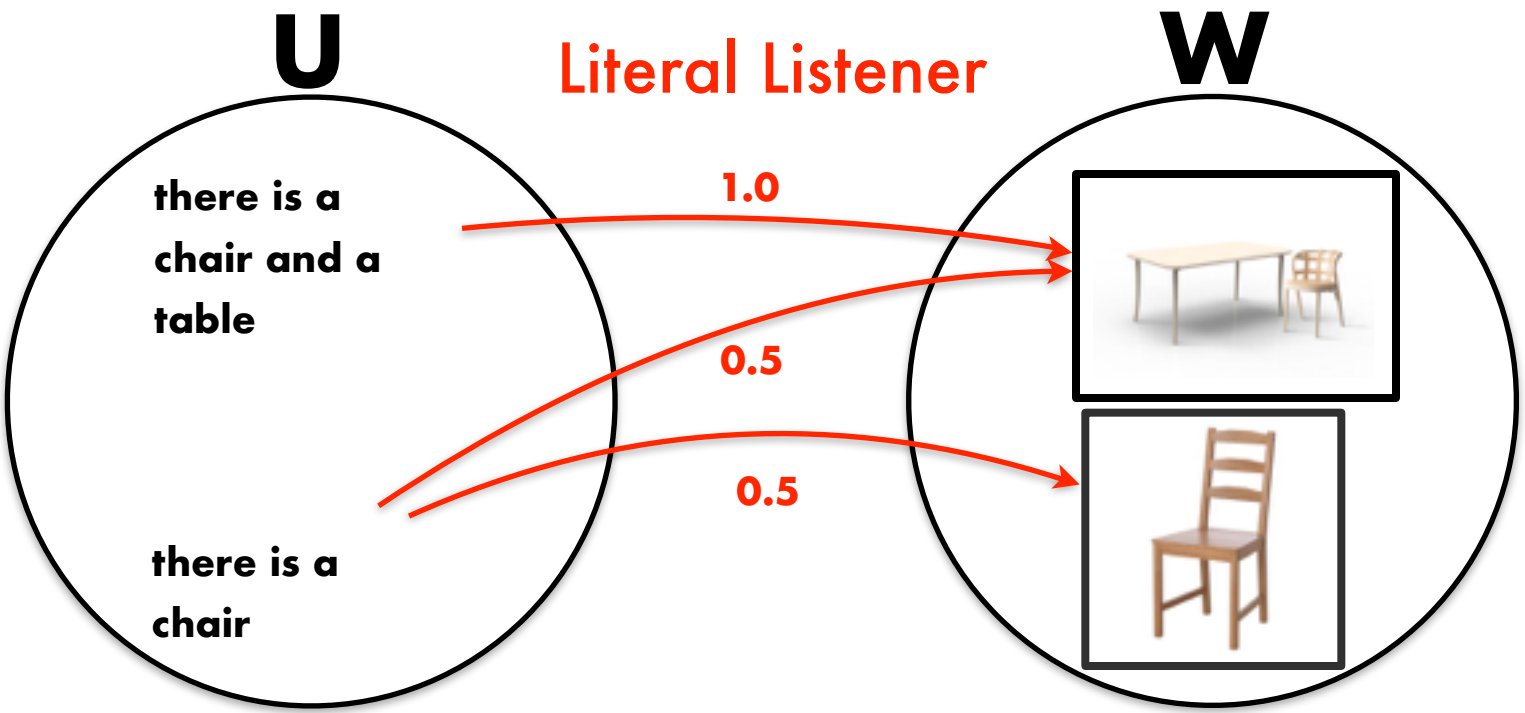
Rational Speech Acts (RSA) paradigm as formalism

Goodman (2016)

Speaker reasons about listener reasoning about speaker...

Speakers and listeners are **conditional distributions**

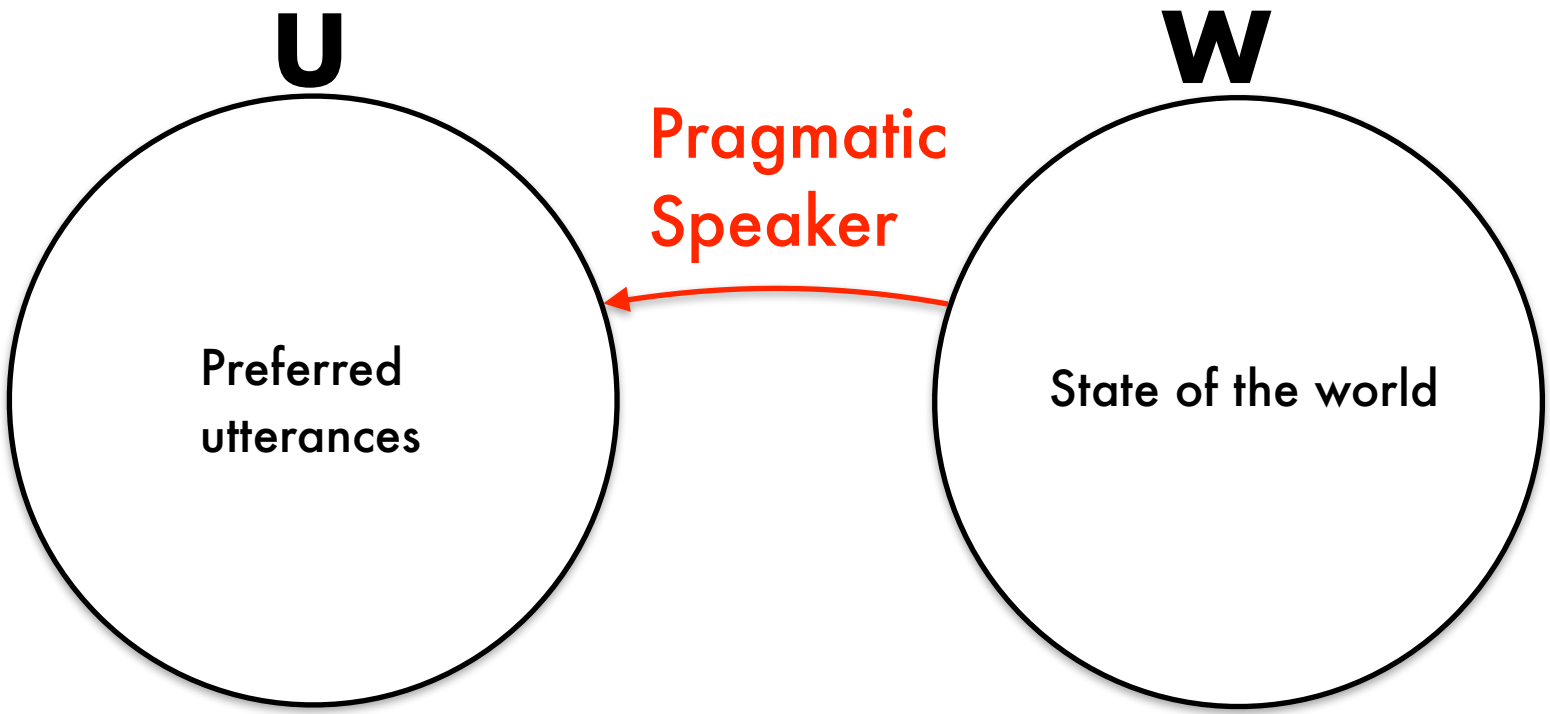
Literal Listener :: U → Distribution(W)



Literal Listener

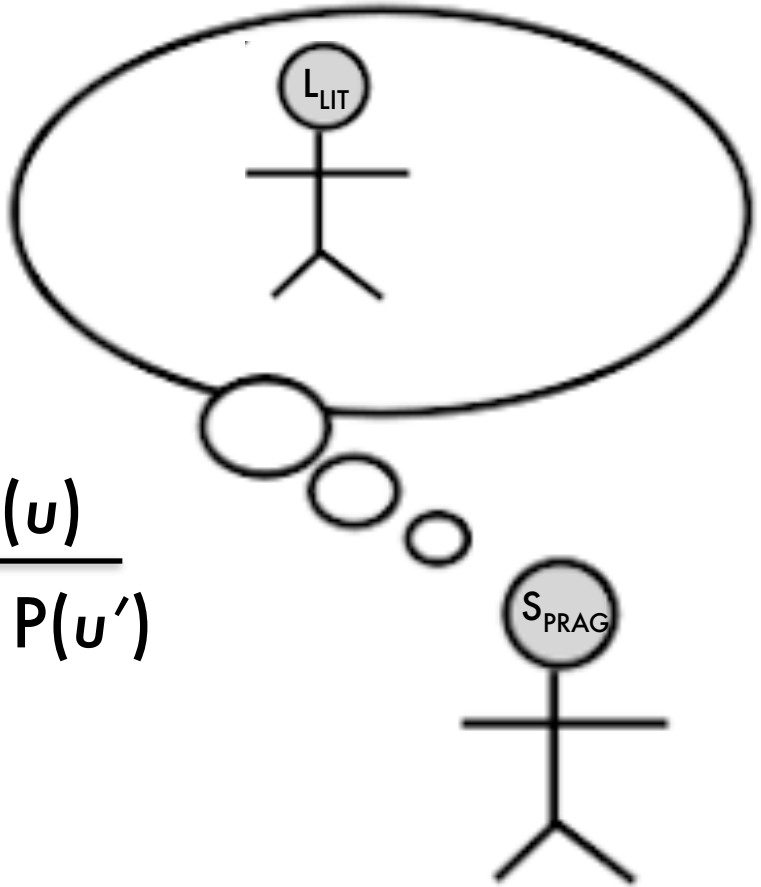
$$L_{LIT}(w \mid u) = \frac{[[u]](w) * P(w)}{\sum_{w'} [[u]](w') * P(w')}$$

Pragmatic Speaker :: W → Distribution(U)



Pragmatic Speaker

$$S_{PRAG}(u \mid w) = \frac{L_{LIT}(w \mid u) \cdot P(u)}{\sum_{u'} L_{LIT}(w \mid u') \cdot P(u')}$$



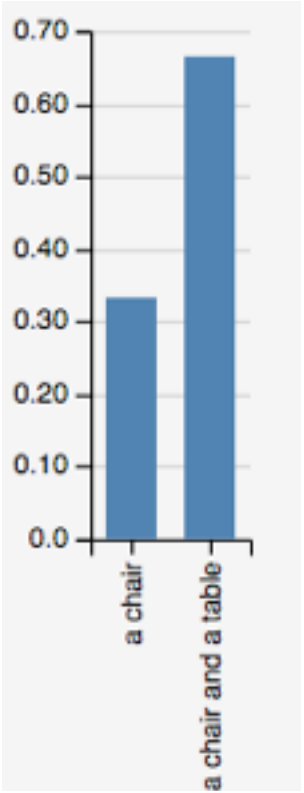
U

there is a chair and a table

there is a chair

W

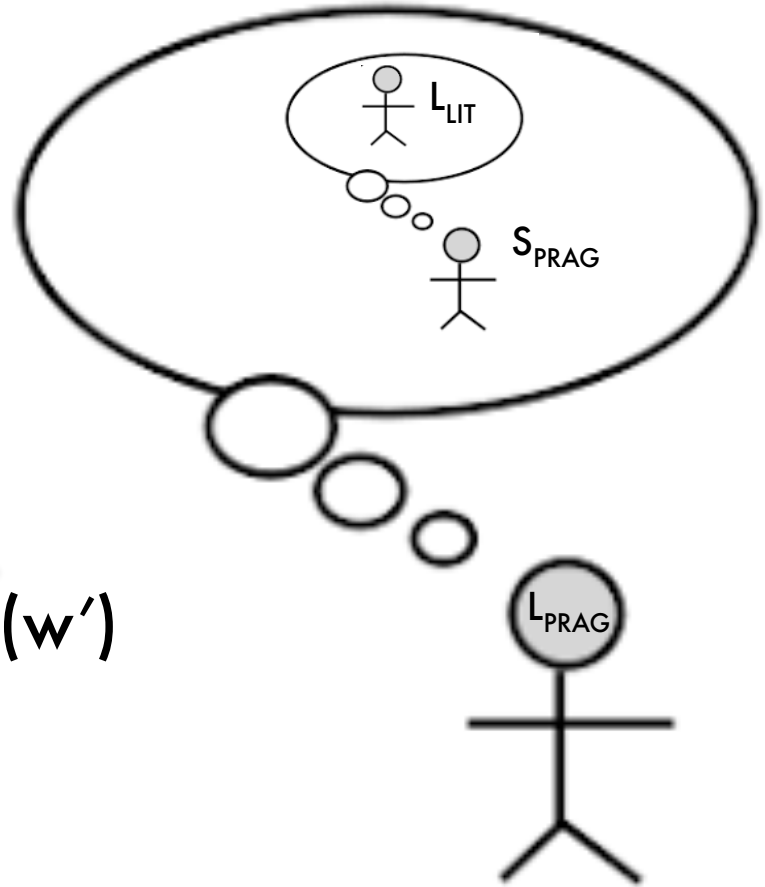
w



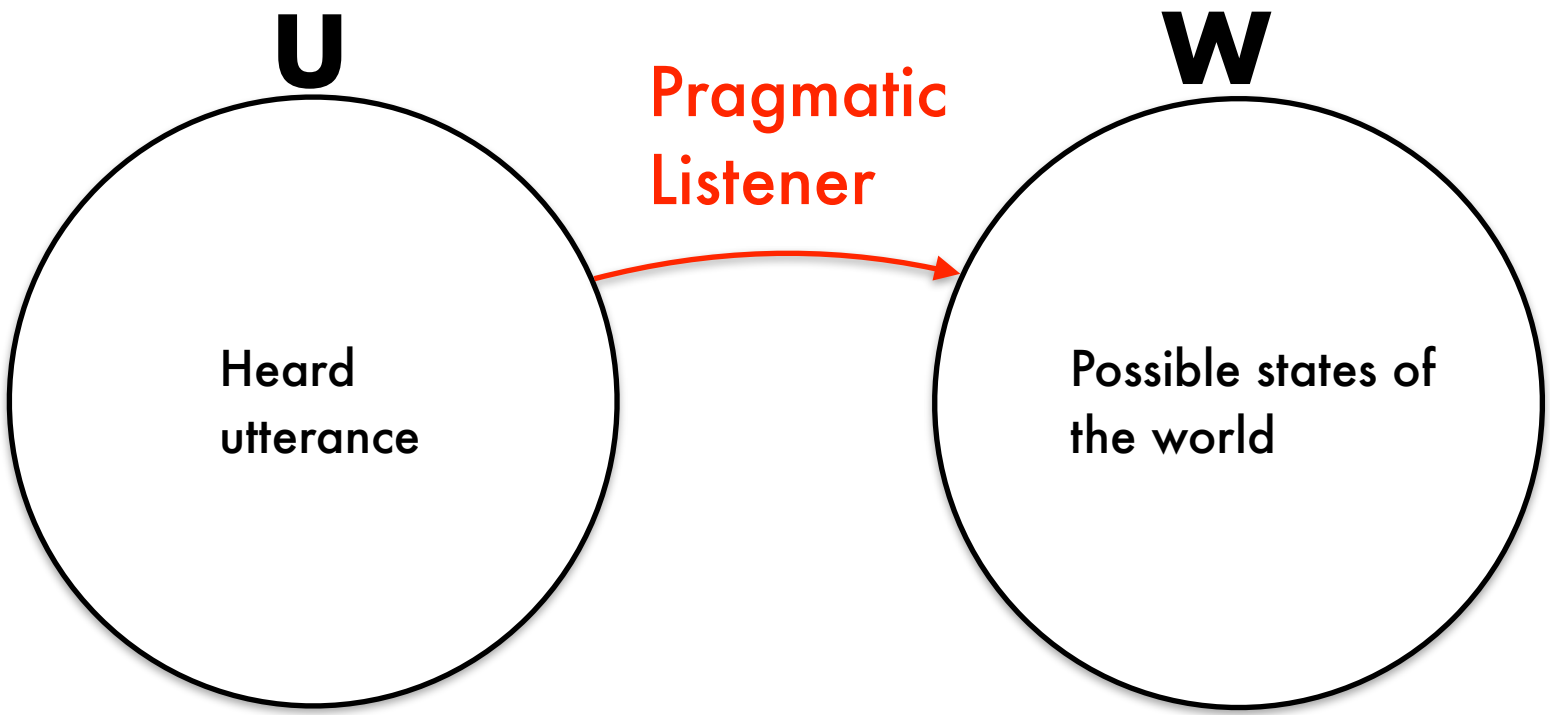
u

Pragmatic Listener

$$L_{PRAG}(w|u) = \frac{S_{PRAG}(u|w) \cdot P(w)}{\sum_{w'} S_{PRAG}(u|w') \cdot P(w')}$$

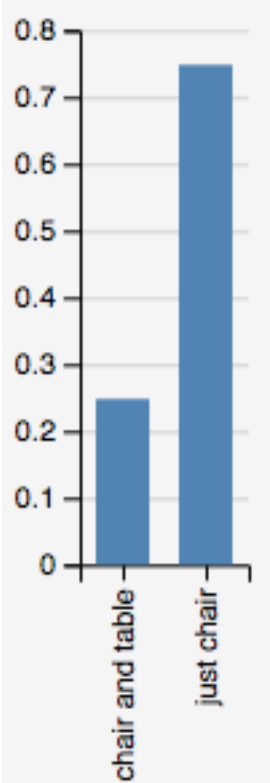


Pragmatic Listener :: U → Distribution(W)



“there is a chair”

u



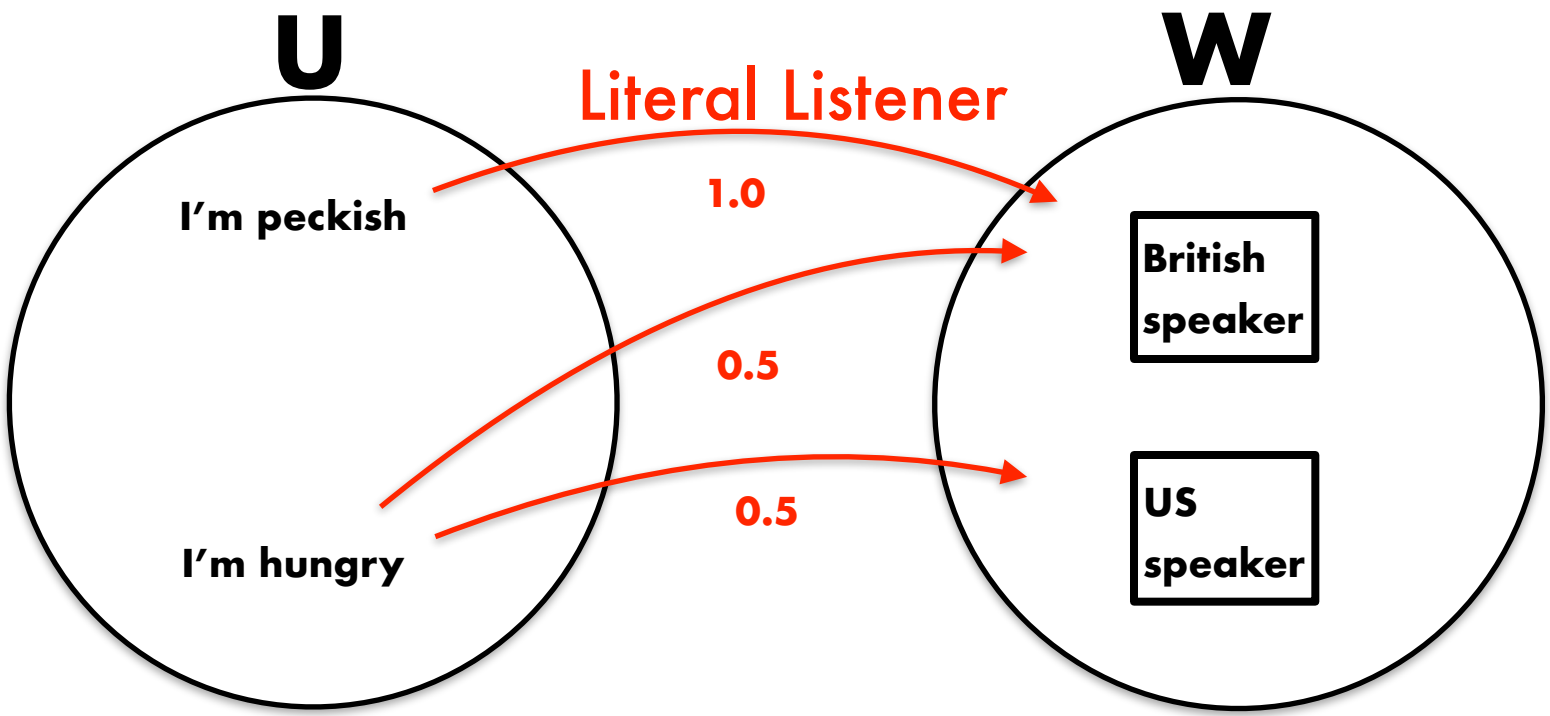
w

Bayesian Sociolinguistics

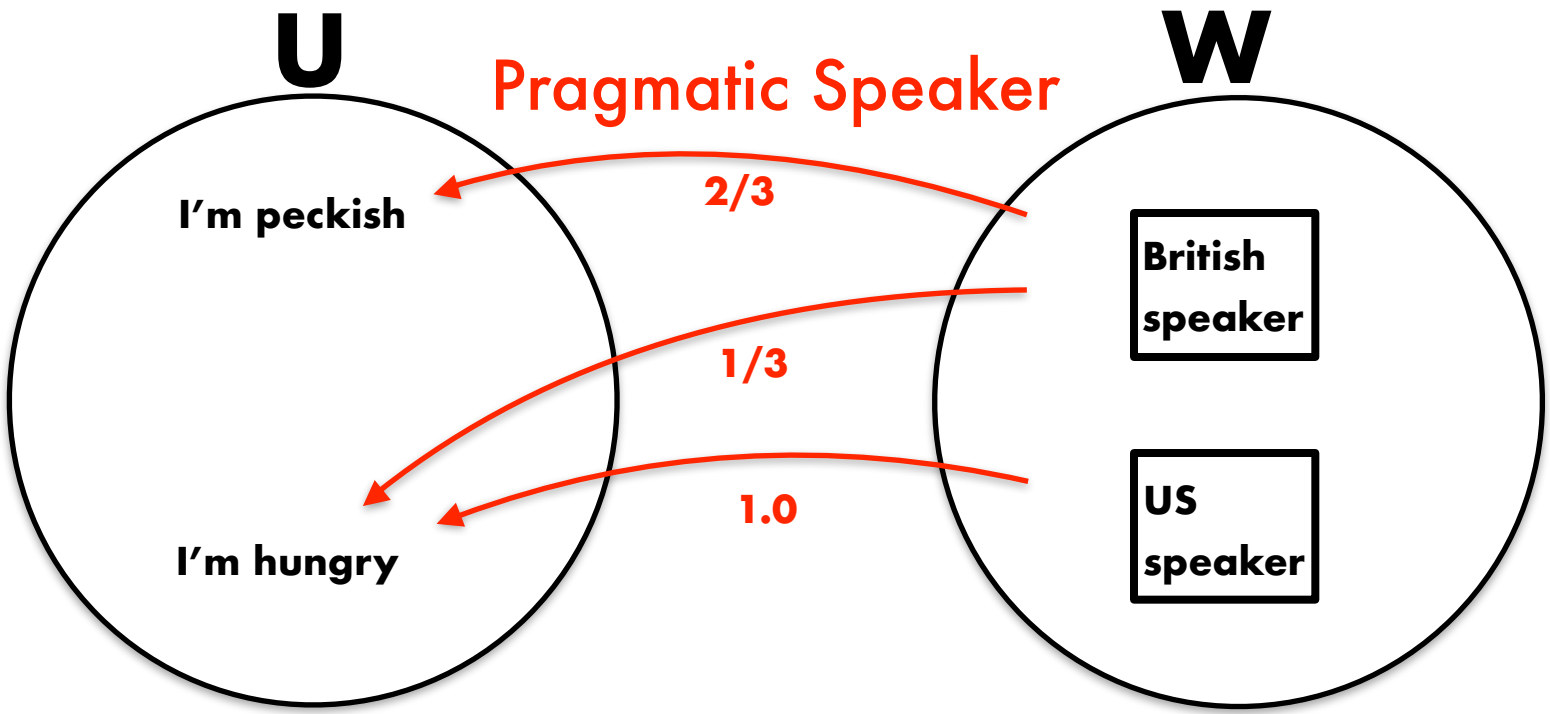
- Great idea from Burnett (2017): uncertainty over speaker identity (**persona**)

- Social reasoning to convey and infer identity

Non-truth conditional meaning



Conveying Identity



Higher-order indexes

- “just as women are not making direct gender claims when they use female-led changes, burnouts are not making direct urban claims when they use urban-led changes…’’

- ``…autonomous, tough, and street- smart. Presumably in adopting urban forms, suburban kids were affiliating with those qualities, not claiming to be urban.” -Eckert

Connection to Metaphor

"The man is a shark"

What aspects of sharks pertain?

- *Vicious*
- But not: *has fins*

Model

- Suppose you believe your interlocutor is an adult, but hear them use child-like language.
- Can we model the inference that they are communicating features associated with children rather than communicating that they are a child?

w

child∧playful	**¬child∧playful**
child∧¬playful	**¬child∧¬playful**

U

childlike features:	**adult features**
- higher pitch - reduplication - over-regularisation - th-fronting	- lower pitch -no reduplication …

Semantics

Child-like features only compatible with *child*

Priors

Prior encodes correlation between *child* and *playful*

child∧playful: 0.15	**¬child∧playful: 0.35**
child∧¬playful: 0.05	**¬child∧¬playful: 0.45**

Literal Listener

What do they infer?

- L_{LIT} (child$\wedge$playful | *child-features*) = 0.75
- L_{LIT} (child$\wedge\neg$playful | *child-features*) = 0.25

S_{PRAG}: The Problem

What if you're an adult but want to signal childlike characteristics?

What's the probability of using child forms?

$S_{\mathbf{PRAG}}$ (*child-features* | ¬child∧playful) = 0.0

Projections (QUDS)

$Q_{child}(child \wedge playful) = \{ child \wedge playful, child \wedge \neg playful \}$

$Q_{playful}(child \wedge playful) = \{ child \wedge playful, \neg child \wedge playful \}$

Speaker with projections

$S_{MET}(u|w,q) \propto \sum_{w'} (1(q(w)=q(w')) * L_0(w'|u)* P(u))$

$S_{MET}(u=\textit{child-features}|\ w=\neg\text{child}\wedge\text{playful}, q=q_{\text{playful}}) = \mathbf{0.59} > 0$

Intuition: This speaker prefers the utterances which convey *the aspect* of the world the QUD cares about to the literal listener.

L_{MET} Infers World and QUD **jointly**

$$L_{MET}(w \mid u) = \frac{S_{MET}(u \mid w, q) \cdot P(w) \cdot P(q)}{\sum_{w', q'} S_{MET}(u \mid w', q') \cdot P(w') \cdot P(q')}$$

Open Questions

- Performativity
- Adversarial Behaviour
- Use-conditional meaning
- Representations of identity

Conclusion

- The connection between sociolinguistics and pragmatics runs deep
- We can evoke **only parts** of a persona:
- Key to expression of complex social identities

Social meaning as use-conditional meaning

Kaplan's (1999) use-conditional meaning:

- To know the meaning of *oops* is to know that
  oops can be felicitously used iff the speaker just observed a minor mishap

- A probabilistic generalization: To know the meaning of *oops* is to know how likely it is used by a *competent* speaker in any given context c, i.e., $S_0(\text{oops} \mid c)$

- Social meaning: To know the meaning of *-ing* is to know
  how likely it is used by a *stereotypical* speaker with index i, i.e., $S_0(\text{-}ing \mid i)$

Another Layer

A speaker who communicates aspect of their persona that they care about

Modelling the way Vineyarders used hypercorrect Martha's Island speech

.

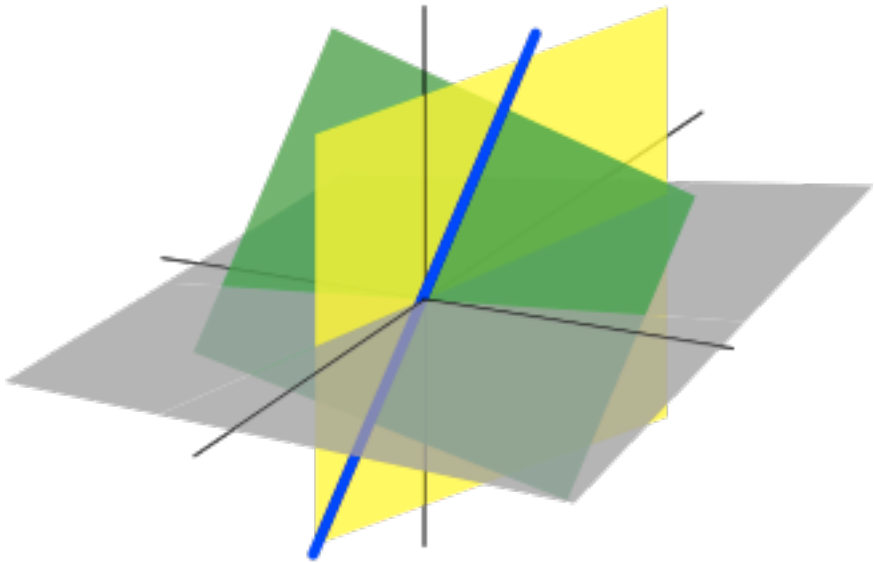
Representing Identity

Should space of identities have meaningful bases?

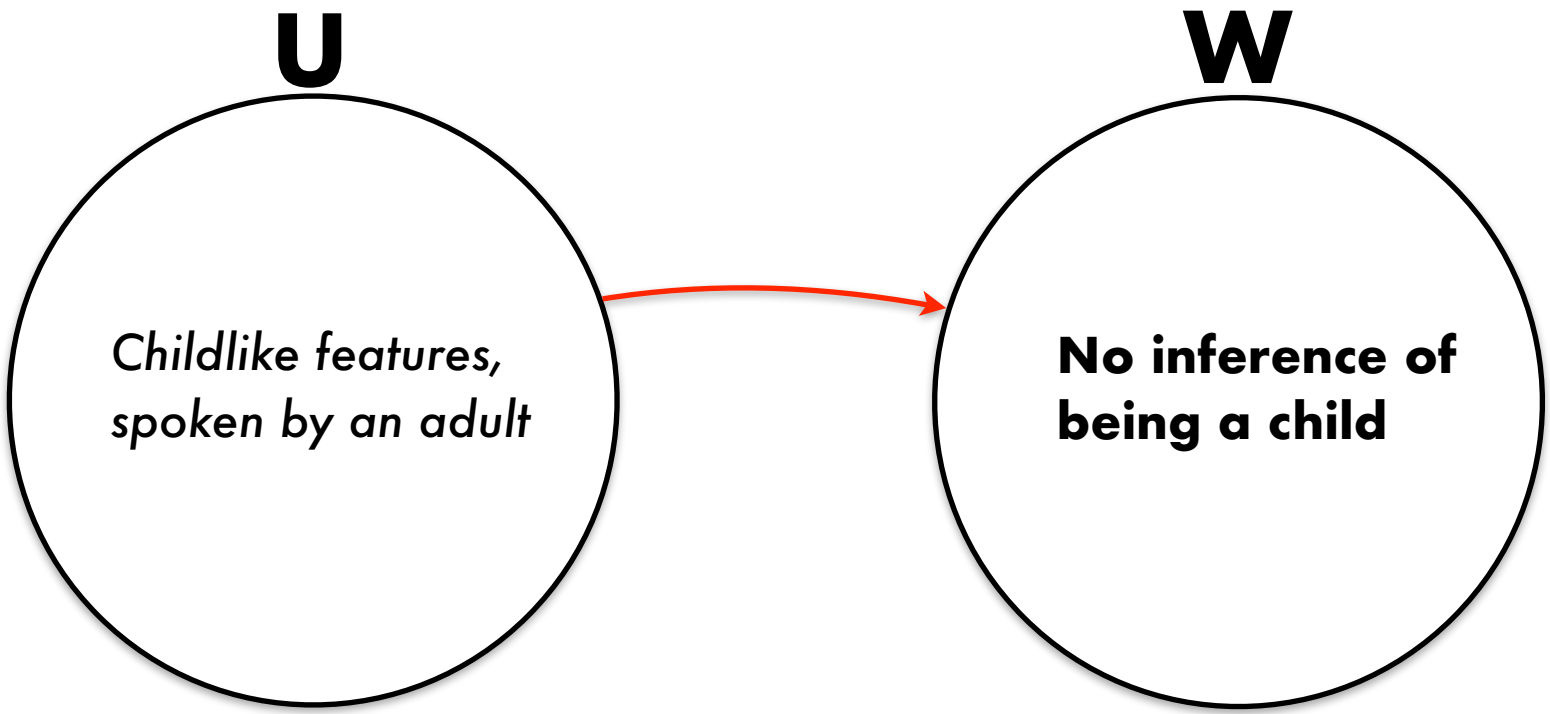
Or should we model it more abstractly?

A vector space as an indexical field?

Compare to word vectors



What about higher order indexes?



	Truth-conditional	Social
Literal listener:	Reasons about state of the world	Reasons about interlocutor's identity
Pragmatic speaker:	Conveys state of the world	Conveys their own identity
Pragmatic listener:	Reasons about what speaker is conveying	Reasons about what identity speaker is conveying