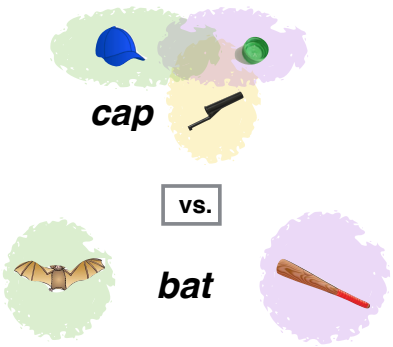
Differences in the Acquisition of Polysemy vs. Ambiguity

Sammy Floyd, Libby Barak & Adele E. Goldberg • Department of Psychology
sfloyd@princeton.edu • lbarak@princeton.edu • adele@princeton.edu

PRINCETON UNIVERSITY

Background

- Many words are **polysemous:** multiple, **related** meanings[1,2]
- Fewer are **ambiguous/homonymous:** have **unrelated** meanings[3,4]



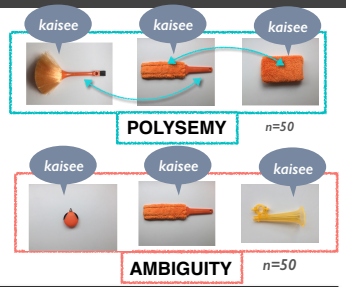
Multiple meanings pose challenge to existing word learning theories.

Often there is no single core meaning:

> *I'm going **home.*** (LOCATION)
> *She's at **home** here.* (COMFORT, COMPETENCE)
> *Springfield is the **home** of basketball* (ORIGIN)
> *She drove the point **home*** (CENTER OF COGNITION)
> (Fillmore 1992)

Experiment– Floyd & Goldberg (in prep)

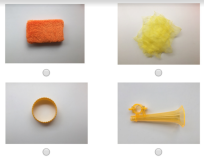
Learning Labels Task
MTurk adults



Exposure:
examples
(1 of 4 sets)

Test:

Select the kaisee.



Nematzadeh, Fazly & Stevenson 2012 (NFS)

Cross-situational word learning with **multi-feature representation**

- each word in a sentence aligned w/ all possible meanings in context
- context **is bag-of-features**
- **not evaluated on more than one sense per word**

Utterance: *She put her **cap** on.* **Scene**: {head, cloth material, cover, sun}

Utterance: *The pen had no **cap**.* **Scene**: {cover, paper, writing, tight-fitting}

Utterance: *She took the **cap** off the bottle.* **Scene**: {drink, liquid, bottle, cover, tight-fitting}

Cap = { **cover**, paper, head, cloth material, writing, **tight-fitting**, bottle, drink, sun }

incorrectly predicts:

✅ *Cap* = { **cover**, cloth material, **tight-fitting**, bottle, drink }

Structured Multi-Feature (SMF)

Word meanings associated to sets of features:

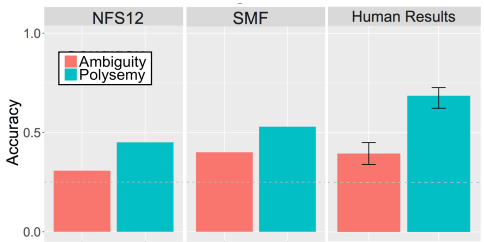
- to compare models on Experimental data, hand-coded 40 features
- features that co-occur are strengthened
  - comparisons across sets of features considers partial overlap (Jacquard distance measure)

Cap = **{**< **cover**, cloth material, head, sun >,
< **cover**, **tight-fitting**, writing, paper >,
< **cover**, **tight-fitting**, drink, bottle > **}**

✕ *Cap* = { **cover**, cloth material, **tight-fitting**, bottle }

SMF model takes into account **structure of features from exposure**
▶incorrect foil isn't selected because representation violates co-occurence statistics

Results



- **Humans show a polysemy > ambiguity advantage in word learning** (ß = 0.28, t = 4.07 p = 0.00078***)
- **Both models show polysemy > ambiguity advantage**
  - **SMF correlates better with human performance** (Pearson correlation):

	NFS12	**SMF**
Polysemy	0.8757	**0.9241**
Ambiguity	0.3701	**0.5108**

Conclusions

- First step toward model of human learning of multiple meanings
- Word meanings learned in sets of features
- Captures polysemy > ambiguity advantage
- Future extensions will incorporate local attention and real-world polysemes with naturalistic features

References

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