Selectional Restrictions

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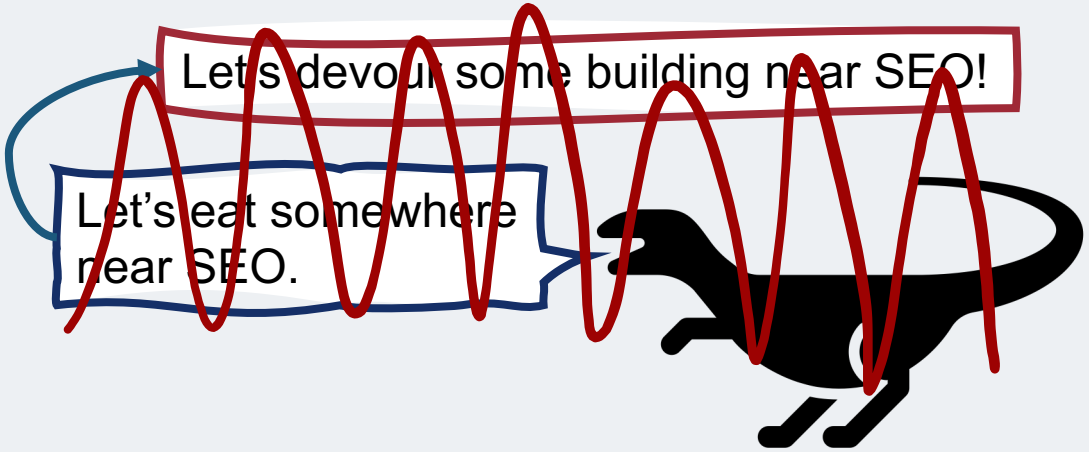
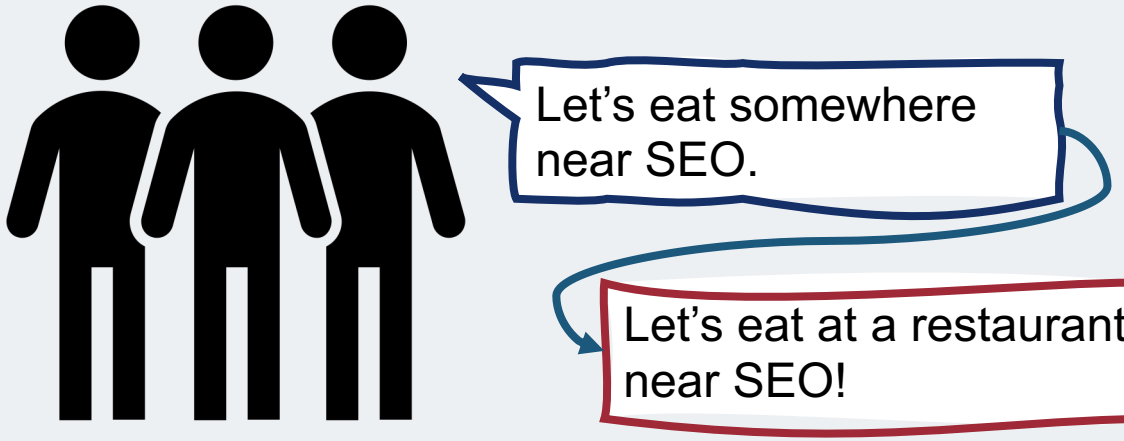
What are selectional restrictions?

- **Selectional restrictions:** Semantic constraints placed upon predicates, governing the types of concepts that can fill those predicates' semantic roles





Selectional Restrictions

- Associated with senses, not words themselves
- Vary in their specificity
  - To eat: THEME should be edible
  - To sip: THEME should be edible and liquid

Representing Selectional Restrictions

$\exists e, x, y\ \text{Eating}(e) \wedge \text{Agent}(e, x) \wedge \text{Theme}(e, y)$

$\exists e, x, y\ \text{Eating}(e) \wedge \text{Agent}(e, x) \wedge \text{Theme}(e, y) \wedge \text{EdibleThing}(y)$

$\exists e, x, y\ \text{Eating}(e) \wedge \text{Eater}(e, x) \wedge \text{Theme}(e, y) \wedge \text{EdibleThing}(y) \wedge \text{Pizza}(y)$

What other ways can we represent selectional restrictions?

- WordNet synsets!
  - Selectional restriction for semantic role = one or more synsets
  - Input is considered reasonable if the word filling that semantic role is a member or hyponym of the specified synset

Selectional Preferences

- **Selectional restrictions** → hard constraints
- **Selectional preferences** → soft constraints

She was way faster than everyone else …the other runners **ate her dust**.

Spit that out, you **can't eat plastic**!

Selectional Preference

- Selectional preferences, $S_R(v)$, are defined as the difference between two distributions:
  - Distribution of the expected semantic classes, $P(c)$
  - Distribution of the expected semantic classes for a specific verb, $P(c|v)$
- This difference can be quantified using **Kullback-Leibler (KL) divergence**, $D(P||Q)$:
  - $D(P||Q) = \sum_x P(x) \log \frac{P(x)}{Q(x)}$
  - $S_R(v) = D(P(c|v)||P(c)) = \sum_c P(c|v) \log \frac{P(c|v)}{P(c)}$

Selectional Association

- **Selectional association** then indicates how much a given class contributes to a verb's overall selectional preference
  - $A_R(v,c) = \frac{1}{S_R(v)} P(c|v) \log \frac{P(c|v)}{P(c)}$
- When using very large corpora, you can also estimate selectional association based on conditional probabilities or log co-occurrence frequencies of predicates with arguments

How do we evaluate selectional preferences?

- **Pseudoword task**
  - Determine which of two words are more preferred by a given verb, and compute how often the selectional preference model makes the correct choice
- **Human selectional preference scores**
  - Check correlation between human selectional preference scores and those predicted by the model