Maintaining Consistency of Monolingual Verb Entries with Inter-Annotator Agreement

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Word Sense Disambiguation in NLP

- statistical machine learning
  - hand-annotated data
  - no rules, just hints what matters (**features**)
- the computer learns to mimic human judgment
- ... but it will never perform the task better than humans themselves do!
- humans must agree on what is correct first

Ambiguity vs. vagueness

vagueness

- a concept allows for borderline cases
  - what does *tall* mean?
- we have a common understanding of the concept but there will individual differences on which instances will be associated with the concept:
  - *a man of 170, 189, 190 cm?*

ambiguity

- a word denotes several concepts that are cognitively very far from each other
- context disambiguates
- normally just one option meant

Ambiguity

- **SPRING (n)**

1. *season between winter and summer*
2. *water flowing up from under the ground*
3. *a long thin metal coil/spiral*
4. *a jump*

Semantic modulation

- NEWSPAPER

1. large printed sheets of folded paper containing news, articles, etc.
2. organization that produces a newspaper (1)

A number of newspapers reported these incidents.

Eventually, Murdoch bought a newspaper, too.

Vagueness

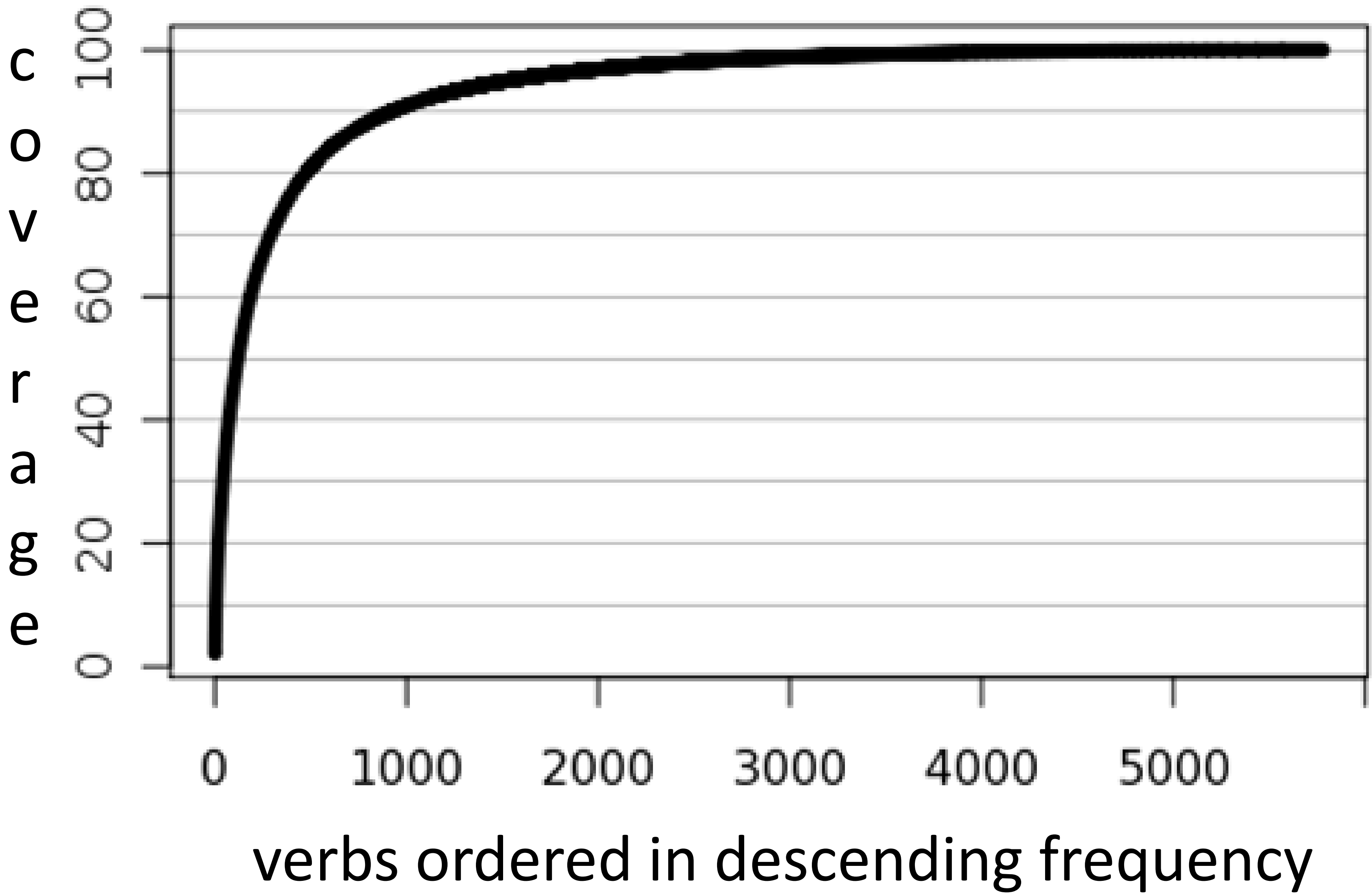
- **GLASS**

1. **hard clear substance**
2. **small container for drinking**
3. (summarizing term for) **attractive artifacts made of glass:** *a collection of Italian glass*
4. mirror ✞
5. barometer✞

Verbs in language

- Verbs denote
  - relations between entities
  - events that entities undergo
- many less words for events/relations than for entities!
- almost any can be described by the top most frequent 1000 verbs

Verbs in BNC 50

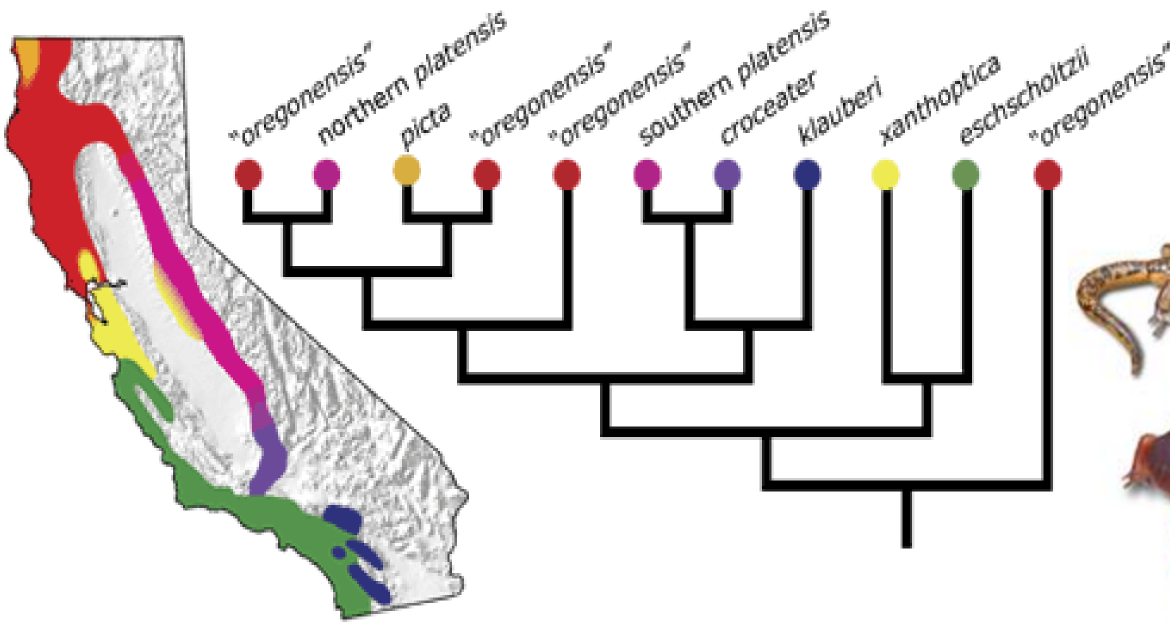


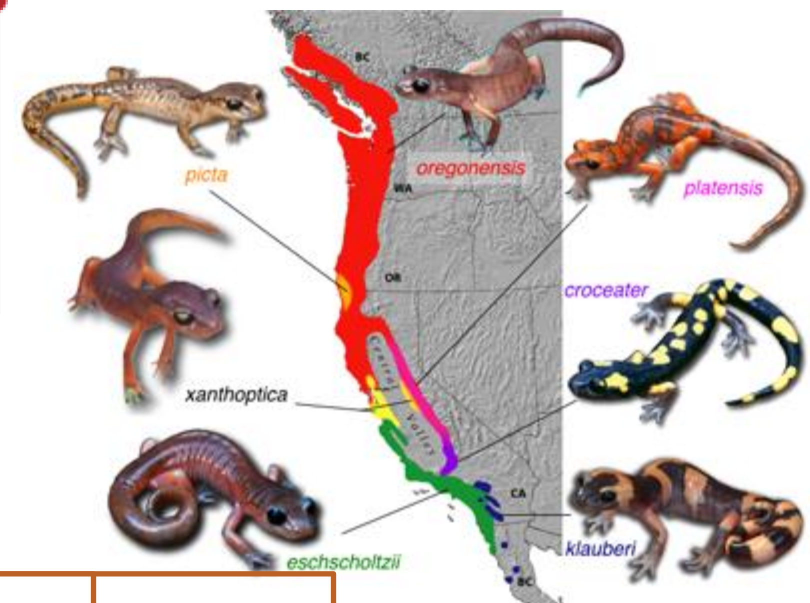
One concept – different events

- with different participants
  - A boy was **throwing/hurling/tossing/blowing** stones.
  - Fast driving on gravel roads **throws** up **rocks** which can scar the car./My wheels **spit** **gravel** and I long for a bigger windshield.
  - Tracey Morton was **thrown** into the air and carried down the road by the motorbike./ I saw this one bus **thrown** across the road/She was **thrown** from her horse.
  - ... fragmental material **thrown** into the air by explosive volcanic activity . The volcano was **throwing/spewing** stones and lava.
  - Dawn **threw/cast** sunlight across the ruins of the old city.

Vagueness: Ensatina salamander

van Deemter, 2010





E1 ❤	E2	❤	E3	❤	E4	❤	E5	❤ E6

Grandchildren can interbreed where parents & grandparents could not.

Inherently vague concept: *throw*

1. Human uses **hands** to **propel** a physical **object** in a direction for a short distance

   *Tourists are encouraged to **throw** coins into the fountains for good fortune.*

2. Human violently **pushes** or shoves or kicks another **human** so that the other human loses control over his movements and **falls**

   He threw her to the ground/against the cupboard…

3. Human **discards** or gets rid of an artifact or **stuff**

   He threw the paper straight into the bin/threw it away, threw it out.

4. Human (**murderer**) disposes of or **discards** or **hides** the **body** of his **victim** to some place

   *Their corpses were **thrown** down a well.*

5. Human **feeds** an **animal/animals** with a physical object or a substance

   *It was like **throwing** a piece of meat to sharks.*

Ambiguity vs. vagueness

ambiguity = no interbreeding
vagueness = interbreeding

propel stuff ❤ discard stuff

propel stuff ❤ feed animals with stuff

discard stuff X discard person

propel stuff X propel person

feed animals with stuff ❤ discard stuff

None of these can breed with others from the set
(throw light, throw into disarray, throw a glance, horse throws...)

A really vague sentence

- *Osbern has his father killed by a lowly mob and* ***thrown*** *to birds and wild animals.*

1. propel stuff
2. push/shove a person
3. discard stuff
4. murderer discard/hide corpse
5. feed animals with stuff

1-5 apply to different degree.
All they have in common outside this context is perhaps the “away” direction.

Other approaches

- "a translation task rather than a classification task" (Liberman, 2009)
- "I don't believe in word senses" (Kilgarriff, 1997)
  - there is no static inventory of meanings; they depend on the final application
- **Non-linguists** agree well on whether or not a word in two contexts is used in the same sense (Rumshisky, Verhagen and Moszkowicz, 2009)
- Textual Entailment: does text *t* entail text *t1*?
  - reasonable interannotator agreement (Bentivogli et al., 2010)

Corpus Pattern Analysis (P. Hanks)

1 **[no object]**
[[Human]^[Animate]^[Vehicle]] zoom AdvDirection
[[Human | Animate| Vehicle]] moves very quickly [[Direction]]

2 **[no object]**
[Artifact | {camera} = Camera] zoom [{in on} Physical Object]
[[Artifact = Camera]] focuses on [[Physical Object]]

3 **[Asset = Price] zoom AdvDirection**
[[Asset = Price]] increases very quickly and dramatically

an archaeologist who	zoomed	1	around the world thrashing Naz
ued that the cameras	zoomed	2	in more often on his Gucci loaf
r pre-tax profits have	zoomed	3	ahead by 92% to almost £27m, a
year to September 30	zoomed	3	from £27.5m to £36.5m.
iant Cable & Wireless	zooming	3	ahead 20p to 667p after 2.4m sh

Corpus Patterns

- Different from dictionary readings
  - meaningful clusters that
    - share one paraphrase
    - the participants in each syntactic position form a homogeneous group
    - have the same morphosyntactic behavior
  - “norms” and “exploitations”

  ride a horse – ride a cat

  being thrown into a pool of desire

What are we doing?

- 40 verb entries made by Patrick Hanks (PDEV)
- 250+ BNC concordances sorted by PH checked/revised by SC
- 3x annotated 50 other concordances
- interannotator agreement measurement
- revisions of entries to ensure interannotator agreement above 0.6 (F/C kappa, Kr. alpha)

Our objectives

- check for each verb whether people can agree on the patterns
- remove superfluous disagreements such as

  “concordance is either a figurative use of X or a syntactic deviation of Y”
- revise bad patterns, revise data (gold standard)
- model superclusters of patterns that come into consideration when context is underspecified
  - in the data rather than in the entries
- teach the computer to make similar (super)clusters
- find out whether these clusters help applications (machine translation, paraphrasing, entailment)

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