Lecture 1: Introduction to Introduction to Computational Semantics

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semantics from PIE root *dheie- "to see, look".

meaning from PIE *meino- "opinion, intent", perhaps from root *men- "to think".

PIE = Proto Indo European

1. Semantics
2. Computational semantics
3. Introduction to computational semantics

Semantics

Semantics = meaning?

- Semantics is a subdiscipline of Linguistics
- Semantics deals with the meaning of sentences and words.
- Its object of study is a specialised kind of linguistic meaning
  - tied to the language signal
  - precisely expressable
  - reasonably objective (language user inspecific)
- This is opposed to *all* meaning in the world
  - private, modified by lived experience
  - entirely subjective

Semantics = meaning?

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PIE = Proto Indo European

- PIE roots reveal this difference
- Note that scientific usage is also opposed to colloquial meaning of "linguistic hair-splitting"

Small differences, big result

(1) a. Kim promised Jo to do the dishes.
    b. Kim wanted to do the dishes.
    c. Jo failed to do the dishes.
    d. Kim persuaded Jo to do the dishes.
    e. Kim managed to do the dishes.

Questions

1. Does a washing up action take place or not?
2. Who is doing the washing up?
3. Do we learn anything else about the washing up?

Computational Semantics

Meta language

a precise representation needs a *language*.

- natural language, e.g. English
- programming language, e.g. Ruby, Scala
- Math, e.g. matrix
- logic, e.g. λ calculus
- automata, e.g. finite-state machines

Representing word meanings with a natural language

Lexicography, e.g. Cambridge Dictionary (https://dictionary.cambridge.org)

blue

- adjective (COLOUR): of the colour of the sky without clouds on a bright day, or a darker or lighter type of this:
- adjective (SAD): feeling or showing sadness

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Two senses of "blue"

Representing word meanings with vectors (1)

Word embedding, word representations, representation learning, “lexical semantics”

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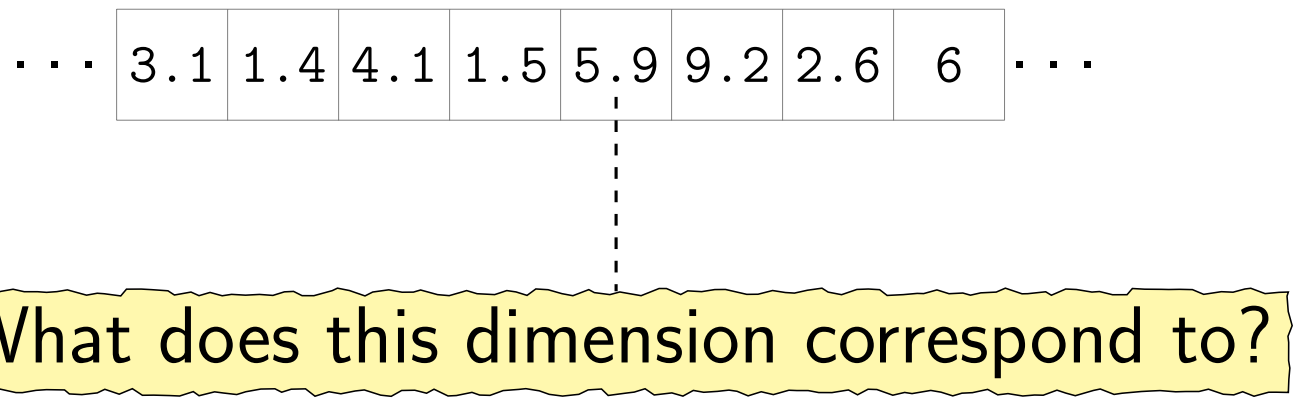

Representing word *meanings* with vectors (2)

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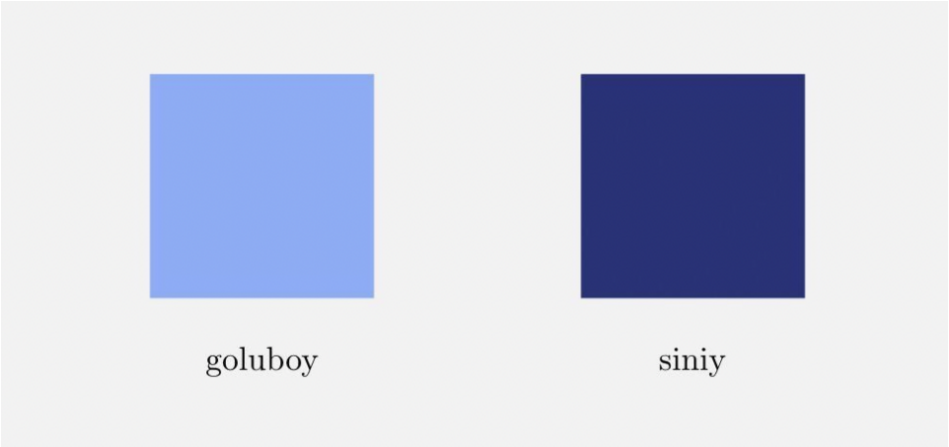
RGB vector = word meaning??

Cultural effects concerning colour blue

- Russian: subdivision of Western “blue”



- Japanese: one single word for Western “green” and “blue”: 青

  Similar effect:

#5B8930	萌黄 Moegi "Fresh Onion", listed with yellow
#6B9362	若竹色 Wakatake-iro "Young bamboo color", listed with blue

from `https://en.wikipedia.org/wiki/Blue-green_distinction_in_language`

Introduction to Computational Semantics

Semantic sub-disciplines

- Lexical Semantics (Word senses, Semantic Roles, . . .)

  How can we define and express what individual words mean

  Often only treated from a distributional viewpoint

- Compositional Semantics (world model, lambda calculus, FOPL, some HOL. . .)

  How basic meaning units are recursively combined

  But meanings of words are often left atomic, i.e. untreated

- Discourse: how larger parts of semantics fit together to form an entire text or dialogue

- Pragmatics: other aspects of communication besides the pure signal can influence the meaning of an utterance. What is left unsaid but can be "calculated" by a human nevertheless (Not many computational approaches available, but lots of research)

Logistics

A lecture-heavy course: 16 lectures!!

1. Event structures
2. Referentiality
3. Truth-conditional semantics
4. Graph-based meaning representation
5. Compositionality
6. Context-free graph rewritting
7. Surface realisation
8. Negation
9. Dynamic semantics
10. Gricean pragmatics
11. Vector space models
12. Cross-modality (guest lecture)
13. Semantics in language acquisition
14. Semantics in language change

Assessment

A lecture-heavy course: 16 lectures!!

5 take-home exercises worth 20% each:

1. Students are given 10 English sentences and asked to provide their semantic analysis according to truth-conditions.
2. Students are given 10 English sentences and asked to provide their syntactico-semantic derivations according to the compositionality principle.
3. All students are assigned with a paper on modelling common ground in dialogue system. Students will receive related but different papers. Each student will write a review of their assigned paper, including a comprehensive summary and their own thoughts.
4. All students are assigned with a paper on language-vision interaction. Students will receive related but different papers. Each student will write a review of their assigned paper.
5. All students are assigned with a paper on bootstrapping language acquisition. All students will receive the same paper. Each student will write a review of the paper.