

# *Lexical Semantics*

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## What is a lexeme?

**Lexeme** should be thought of as a pairing of a particular orthographic and phonological form with some sort of symbolic meaning representation.

- Orthographic form, and phonological form refer to the appropriate form part of a lexeme
- Sense refers to a lexeme's meaning counterpart.

# Example

## verge<sup>1</sup> | vɜːdʒ |

noun

an edge or border: *they came down to the verge of the lake.*

- an extreme limit beyond which something specified will happen: *I was **on the verge of** tears.*
- Brit. a grass edging such as that by the side of a road or path.
- Architecture an edge of tiles projecting over a gable.

verb [no obj.] (**verge on**)

approach (something) closely; be close or similar to (something): *despair verging on the suicidal.*

ORIGIN late Middle English: via Old French from Latin *virga* 'rod.' The current verb sense dates from the late 18th cent.

## verge<sup>2</sup> | vɜːdʒ |

noun

a wand or rod carried before a bishop or dean as an emblem of office.

ORIGIN late Middle English: from Latin *virga* 'rod.'

## verge<sup>3</sup> | vɜːdʒ |

verb [no obj.]

incline in a certain direction or toward a particular state: *his style verged into the art nouveau school.*

ORIGIN early 17th cent. (in the sense '*descend (to the horizon)*'); from Latin *vergere* 'to bend, incline.'

## *Example: meaning related facts?*

### *Definitions from the American Heritage Dictionary (Morris, 1985)*

- **right** *adj.* located near the right hand esp. being on the right when facing the same direction as the observer
- **left** *adj.* located near to this side of the body than the right
- **red** *n.* the color of blood or a ruby
- **blood** *n.* the red liquid that circulates in the heart, arteries and veins of animals

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- The entries are description of lexemes in terms of other lexemes
- Definitions make it clear that *right* and *left* are similar kind of lexemes that stand in some kind of alternation, or opposition, to one another
- We can glean that *red* is a color, it can be applied to both *blood* and *rubies*, and that *blood* is a liquid.

# *Relations between word meanings*

- Homonymy
- Polysemy
- Synonymy
- Antonymy
- Hypernymy
- Hyponymy
- Meronymy



# Homonymy

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## *homophones and homographs*

**homophones** are the words with the same pronunciation but different spellings.

- write vs right
- piece vs peace

**homographs** are the lexemes with the same orthographic form but different meaning. Ex: bass

# *Problems for NLP applications*

## *Text-to-Speech*

Same orthographic form but different phonological form

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## *Speech Recognition*

to, two, too

*Perfect homonyms are also problematic*

*Multiple **related** meanings within a single lexeme.*

- The *bank* was constructed in 1875 out of local red brick.
- I withdrew the money from the *bank*.

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*Are those the same sense?*

- Sense 1: “The building belonging to a financial institution”
- Sense 2: “A financial institution”

*Another example*

- Heavy snow caused the roof of the *school* to collapse.
- The *school* hired more teachers this year than ever before.



# *Polysemy: multiple related meanings*

*Often, the relationships are systematic*

E.g., building vs. organization

*school, university, hospital, church, supermarket*

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*More examples:*

- Author (Jane Austen wrote Emma) ↔ Works of Author (I really love Jane Austen)
- Animal (The chicken was domesticated in Asia) ↔ Meat (The chicken was overcooked)
- Tree (Plums have beautiful blossoms) ↔ Fruit (I ate a preserved plum yesterday)

# *Polysemy: multiple related meanings*

## *Zeugma test*

- Which of these flights *serve* breakfast?
- Does Midwest Express *serve* Philadelphia?

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*Combine two separate uses of a lexeme into a single example using conjunction*

Since it sounds weird, we say that these are two different senses of *serve*.

*Words that have the same meaning in some or all contexts.*

- filbert / hazelnut
- couch / sofa
- big / large
- automobile / car
- vomit / throw up
- water /  $H_2O$

Two lexemes are synonyms if they can be successfully substituted for each other in all situations.

# Synonymy: A relation between senses

Consider the words *big* and *large*.

*Are they synonyms?*

- How **big** is that plane?
- Would I be flying on a **large** or small plane?

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*How about here?*

- Miss Nelson, for instance, became a kind of **big** sister to Benjamin.
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- How **big** is that plane?
- Would I be flying on a **large** or small plane?

*How about here?*

- Miss Nelson, for instance, became a kind of **big** sister to Benjamin.
- \*Miss Nelson, for instance, became a kind of **large** sister to Benjamin.

*Why?*

- *big* has a sense that means being older, or grown up
- *large* lacks this sense

## *Shades of meaning*

- What is the cheapest first class *fare*?
- \*What is the cheapest first class *price*?

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## *Collocational constraints*

- We frustrate 'em and frustrate 'em, and pretty soon they make a *big* mistake.
- \*We frustrate 'em and frustrate 'em, and pretty soon they make a *large* mistake.

- Senses that are opposites with respect to one feature of their meaning
- Otherwise, they are similar!
  - ▶ dark / light
  - ▶ short / long
  - ▶ hot / cold
  - ▶ up / down
  - ▶ in / out

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*More formally: antonyms can*

- define a binary opposition or at opposite ends of a scale (*long/short, fast/slow*)
- Be **reversives**: *rise/fall*

# Hyponymy and Hypernymy

## Hyponymy

One sense is a hyponym of another if the first sense is more specific, denoting a subclass of the other

- *car* is a hyponym of *vehicle*
- *dog* is a hyponym of *animal*
- *mango* is a hyponym of *fruit*

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## Hypernymy

Conversely

- *vehicle* is a hypernym/superordinate of *car*
- *animal* is a hypernym of *dog*
- *fruit* is a hypernym of *mango*

# *Hyponymy more formally*

## *Entailment*

Sense  $A$  is a hyponym of sense  $B$  if being an  $A$  entails being a  $B$ .

Ex: dog, animal

## *Transitivity*

$A$  hypo  $B$  and  $B$  hypo  $C$  entails  $A$  hypo  $C$



# Meronyms and holonyms

## Definition

**Meronymy:** an asymmetric, transitive relation between senses.

$X$  is a **meronym** of  $Y$  if it denotes a part of  $Y$ .

The inverse relation is **holonymy**.

meronym	holonym
porch	house
wheel	car
leg	chair
nose	face