- **Next lectures**
  - Word sense disambiguation
    - » Background from linguistics
      - ◆ Lexical semantics
    - » On-line resources
    - » Computational approaches

Lexical semantic relations

- Homonyms: *words that have the same orthographic and phonological form and unrelated meanings*
  - Instead, a **bank¹** can hold the investments in a custodial account in the client's name.
  - But as agriculture burgeons on the east **bank²**, the river will shrink even more.
- Homophones: distinct lexemes with a shared pronunciation
  - E.g. *would* and *wood*, *see* and *sea*.
- Homographs: identical orthographic forms, different pronunciations, and unrelated meanings
  - The expert angler from Dora, Mo., was fly-casting for **bass** rather than the traditional trout.
  - The curtain rises to the sound of angry dogs baying and ominous **bass** chords sounding.

Why do these distinctions matter?

- One type or another is more likely to affect specific NLP applications.
  - Spelling correction?

  - Speech recognition?

  - Text-to-speech?

Lexical semantic relations: polysemy

- Polysemy: the phenomenon of multiple *related* meanings within a single lexeme
  - Example: While some **banks** furnish blood only to hospitals, others are much less restrictive.
  - New sense, e.g. bank³?
  - Polysemy allows us to associate a lexeme with a set of related senses.
- Distinguishing homonymy from polysemy is not always easy. Decision is based on:
  - Etymology: history of the lexemes in question
  - Intuition of native speakers

Word sense disambiguation

- Given a *fixed* set of senses associated with a lexical item, determine which of them applies to a particular instance of the lexical item in running text
- Two fundamental approaches
  - WSD occurs during semantic analysis as a side-effect of the elimination of ill-formed semantic representations
  - Stand-alone approach
    - » WSD is performed independent of, and prior to, compositional semantic analysis
    - » Makes minimal assumptions about what information will be available from other NLP processes
    - » Applicable in large-scale practical applications

Synonymy

- Lexemes with the same meaning
- Invoke the notion of **substitutability**
  - Two lexemes will be considered synonyms if they can be substituted for one another in a sentence without changing the meaning or acceptability of the sentence
    - » How *big* is that plane?
    - » Would I be flying on a *large* or small plane?
    - » Miss Nelson, for instance, became a kind of *big* sister to Mrs. Van Tassel's son, Benjamin.
    - » We frustrate 'em and frustrate 'em, and pretty soon they make a *big* mistake.
    - » Also issues of **register**
      - ◆ Social factors that surround the use of possible synonyms, e.g. politeness, group status.

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WordNet

- Handcrafted database of lexical relations
- Three separate databases: nouns; verbs; adjectives and adverbs
- Each database is a set of lexical entries (according to unique orthographic forms)
  - Set of senses associated with each entry

Category	# Unique Forms	# of Senses
Noun	117798	82115
Verb	11529	13767
Adjective	21479	18156
Adverb	4481	3621

WordNet Browser

Word to search for: bass   (Search WordNet)

Display Options: (Select option to change) ⇕ (Change)

Key: "S:" = Show Synset (semantic) relations, "W:" = Show Word (lexical) relations
Display options for sense: (gloss) "an example sentence"

Noun

- S: (n) **bass** (the lowest part of the musical range)
- S: (n) **bass**, bass part (the lowest part in polyphonic music)
- S: (n) **bass**, basso (an adult male singer with the lowest voice)
- S: (n) sea bass, **bass** (the lean flesh of a saltwater fish of the family Serranidae)
- S: (n) freshwater bass, **bass** (any of various North American freshwater fish with lean flesh (especially of the genus Micropterus))
- S: (n) **bass**, bass voice, basso (the lowest adult male singing voice)
- S: (n) **bass** (the member with the lowest range of a family of musical instruments)
- S: (n) **bass** (nontechnical name for any of numerous edible marine and freshwater spiny–finned fishes)

Adjective

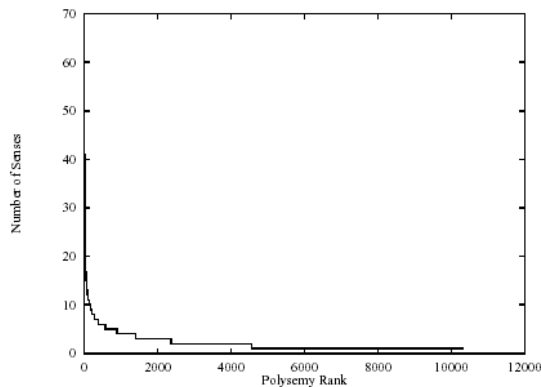- S: (adj) **bass**, deep (having or denoting a low vocal or instrumental range) *"a deep voice"; "a bass voice is lower than a baritone voice"; "a bass clarinet"*

Some WordNet Statistics

Part-of-speech	Avg Polysemy	Avg Polysemy w/o monosemous words
Noun	1.24	2.79
Verb	2.17	3.57
Adjective	1.40	2.71
Adverb	1.25	2.50

Distribution of senses

- Zipf distribution of verb senses

WordNet relations

- Nouns

Relation	Definition	Example
Hypernym	From concepts to superordinates	breakfast → meal
Hyponym	From concepts to subtypes	meal → lunch
Has-Member	From groups to their members	faculty → professor
Member-Of	From members to their groups	copilot → crew
Has-Part	From wholes to parts	table → leg
Part-Of	From parts to wholes	course → meal
Antonym	Opposites	leader → follower

- Verbs

Relation	Definition	Example
Hypernym	From events to superordinate events	fly → travel
Troponym	From events to their subtypes	walk → stroll
Entails	From events to the events they entail	snore → sleep
Antonym	Opposites	increase ⟺ decrease

- Adjectives/adverbs

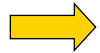| Relation	Definition	Example
Antonym	Opposite	heavy ⟺ light
Adverb	Opposite	quickly ⟺ slowly

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