L114 Lexical Semantics

Session 1: Background to Lexical Semantics and Word Senses

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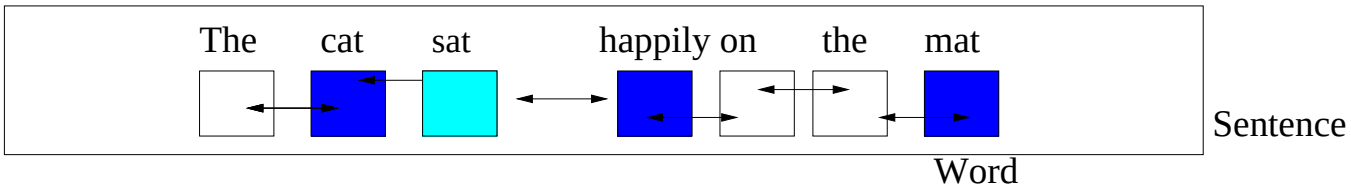
What does a word *mean*?

burn

Units of Linguistic Meaning



L90 Overview of NLP and L95 Introduction to NL Syntax and Semantics – how to assemble meaning from individual words inside a sentence (compositional semantics). Individual words' meanings is untreated (left as "atomic").
L114 Lexical Semantics looks at meanings of individual words – how to define the meaning of a word, mostly by its interaction with other words.

How can we study Word Meaning?

- Look for cases where something goes wrong.
- Jokes and intentionally or unintentionally strange headlines are a good starting point.

X-proofing

acid-proof, affair-proof, air-proof, ant-proof, baby-proof, bat-proof, bear-proof, bite-proof, bomb-proof, bullet-proof, burglar-proof, cat-proof, cannon-proof, claw-proof, coyote-proof, crash-proof, crush-proof, deer-proof, disaster-proof, dust-proof, dog-proof, elephant-proof, escape-proof, explosion-proof, fade-proof, fire-proof, flame-proof, flood-proof, fool-proof, fox-proof, frost-proof, fume-proof, gas-proof, germ-proof, glare-proof, goof-proof, gorilla-proof, grease-proof, hail-proof, heat-proof, high-proof (110-proof, 80-proof), hurricane-proof, ice-proof, idiot-proof, jam-proof, leak-proof, leopard-proof, lice-proof, light-proof, mole-proof, moth-proof, mouse-proof, nematode-proof, noise-proof, oil-proof, oven-proof, pet-proof, pilfer-proof, porcupine-proof, possum-proof, puncture-proof, quake-proof, rabbit-proof, raccoon-proof, radiation-proof, rain-proof, rat-proof, rattle-proof, recession-proof, rip-proof, roach-proof, rub-proof, rust-proof, sand-proof, scatter-proof, scratch-proof, shark-proof, shatter-proof, shell-proof, shock-proof, shot-proof, skid-proof, slash-proof, sleet-proof, slip-proof, smear-proof, smell-proof, smudge-proof, snag-proof, snail-proof, snake-proof, snow-proof, sound-proof, stain-proof, steam-proof, sun-proof, tamper-proof, tear-proof, teenager-proof, tick-proof, tornado-proof, trample-proof, varmint-proof, veto-proof, vibration-proof, water-proof , weasel-proof, weather-proof, wind-proof, wolf-proof, wrinkle-proof, x-ray-proof, zap-proof

`source: www.wordnik.com/lists/heres-your-proof`

Language is ambiguous in many ways!

- Looking for cases where something goes wrong is often the best ways to learn how a complex system — such as language — works.
- Ambiguity means that one sentence or string of language has more than one meaning:
  - *Stolen painting found by tree*
  - *Killer sentenced to die for second time in 10 years*
  - *Iraqi head seeks arms*
- Cases like these could be considered as "language going wrong", but the ambiguity of language is a design feature of language:
  - *I went on holiday with my friend.*
- Ambiguity is ubiquitous

How can we study Word Meaning?

- Recognise and classify ambiguities
- Describe and examine word senses
  Example:
  - *We unhinged the door.*
  - *We walked through the door.*
  - *?We unhinged the door and walked through it.*

$$door,\ window = \begin{cases} \text{opening in wall} \\ \text{cover for opening} \end{cases}$$

- Automatically recognise word senses in text
- Recognise and interpret figurative use of words
- Define similarities between words
- Determine how strongly a verb "goes with" its subject
- Describe relations between words (or rather, between word senses)

Different Kinds of Ambiguity

- Purely syntactic:
  - *young women and men*
- Quasi-syntactic:
  - *a red pencil*
- Lexico/syntactic:
  - *we saw her duck*
- Purely lexical:
  - *He reached the bank*

Judging ambiguity, "normality" and semantic differences

Diagnostic Methodology: Construct a linguistic context for a word, then judge normality/truthconditional status of that utterance. (Does it sound odd? Could it be true?)

- *a female mother.*
  BUT: *a female pianist.*
- *Kate was very married.*
  BUT: *Kate was married.*
- *The kitten drank a bottle of claret.*
  BUT: *The undergraduate drank a bottle of claret.*
- *Arthur and his driving licence expired last Thursday*
  BUT: *Arthur's passport and his driving licence expired last Thursday*

The coloured sentences are odd (for different reasons); the black ones are not. Why?

Aspects of semantic oddness

- Pleonasm: Tautologies; redundant information
  - *a female mother*
- Dissonance: "Selectional restrictions" are violated.
  - *Kate was very married*
- Improbability: The truthconditional conditions of the utterance are untrue/unlikely in most possible worlds, but one can imagine the situation under special circumstances.
  - *The kitten drank a bottle of claret*
- Zeugma: Two senses of a word are activated simultaneously.
  - *Arthur and his driving licence expired last Thursday*
  - *? The poisoned chocolate entered the Contessa's mouth at the same instant that the yacht entered that of the river.*

Over to you (solutions in textbook)

- *He was wearing a scarf, a pair of boots, and a look of considerable embarrassment.*
- *Let us drink time.*
- *He was murdered illegally.*
- *Kick it with one of your feet.*
- *The throne is occupied by a chain-smoking alligator.*
- *They took the door off its hinges and walked through it.*
- *We smashed the window then climbed through it.*

Now we need some terminology

- Sentence: linguistic object; no truthconditional content.
  - *John saw Mary.*
  - *John's sister was seen by Peter's uncle.*
- Proposition: fact in the world
  - has truthconditional content (once instantiated)
  - is independent of linguistic form
  - There are only two kinds:
    - relation between two or more entities
    - attribution of property to an entity
- Statement:
  - Sentence + Proposition + Situation (reference) $\rightarrow$ linguistic form and truth-conditional content

Entailment

A proposition P is said to entail another proposition Q (P $\Rightarrow$ Q) if the truth of Q is a logically necessary consequence of the truth of P (and the falsity of P is a necessary consequence of the falsity of Q).

- Sentence P *"That is a dog"* entails sentence Q *"That is an animal"*.
- This means in every situation where I can say P I can also say Q:
  - *It can't possibly be a dog and not an animal.*
  - *It's a dog therefore it's an animal.*
  - *If it is not an animal, then it follows that it's not a dog.*
  - *? It's a dog, so it must be a cat.*
  - *? It's not an animal, but it's just possible that it's a dog.*
  - *? It's a dog, so it might be an animal*

Types of entailment

Unilateral entailment:

- *It's a dog* $\Rightarrow$ *It's an animal*
- *It's an animal* $\not\Rightarrow$ *It's a dog*

Mutual entailment (logical equivalence):

- *The meeting began at 10am* $\Leftrightarrow$
  The meeting commenced at 10am.

Contrariety:

- *It's a cat* $\Rightarrow$ *It's not a dog.*
- *It's a not a cat* $\not\Rightarrow$ *It's a dog.*

Contradiction:

- *It's dead* $\Rightarrow$ *It's not alive.*
- *It's alive* $\Rightarrow$ *It's not dead.*

Syntagmatic vs. paradigmatic affinities

Words form two kinds of affinities:

- Syntagmatic: semantic associations between items within a sentence:
  - *dog ... barked . . .*

  "semantic traits" of a target word.
- Paradigmatic: semantic affinities between two grammatically identical words which can replace each other in a sentence:
  - *I haven't yet fed the [dog/cat/*lamppost].*

The meaning of a word is only defined by these two sets: its syntagmatic and its paradigmatic affinities.

Semantic Traits (Syntagmatic)

Semantic traits are syntagmatic properties attributed to an entity and can be of different types:

- critical: *animal–dog*
  - *It's a dog* logically entails *It's an animal*:
    If it's a dog, it's necessarily an animal.
- expected: *bark–dog*:
  - *It's a dog, but it can't bark.*
  - ? *It's a dog, but it can bark.*
- possible: *brown–dog*
  - ? *It's a dog, but it is brown.*
  - ? *It's a dog, but it isn't brown.*
- unexpected: *can sing–dog*
  - *It's a dog, but it can sing.*
  - ? *It's a dog, but it can't sing.*

Semantic Traits, Ctd.

- excluded: *cat–dog*
  - *It's a dog* logically entails *It's not a cat*.
- canonical: *has four legs–dog*
  - A canonical trait is an expected trait whose absence is regarded as a defect.
    - ? *The typical dog has 4 legs.*
    - ? *A dog that does not have 4 legs is not necessarily defective.*
    - *The typical bird is adapted for flight.*
    - *A bird that cannot fly is not necessarily defective.*

$\rightarrow$ *"has four legs"* is canonical; *"can fly"* is merely expected.

Paradigmatic vs. syntagmatic

Syntagmatic and paradigmatic affinities highlight different aspects of similarity:

- *cat* and *dog*
  - have a high degree of paradigmatic affinity
  - but syntagmatically, they are excluded traits of each other.
- *animal* and *dog*
  - syntagmatically closer related (*animal* being a critical trait of *dog*
  - but they are paradigmatically further apart from each other than *cat* and *dog*.

"SHOWER" has more than one word sense

- Handout: corpora examples for "shower".
- After break – please tell me how many senses "shower" has.
- Please work in groups.
- Please disregard "shower" if it occurs in a compound noun (together with another noun, e.g., "shower curtain" or "luxury shower")

Word Senses

- Why do some word forms have more than one sense?
  - Random historic effects → homonymy
  - Senses evolve and are connected → polysemy
- Underspecification is different from word senses:
  - *child* could be a boy or a girl (underspecified)
  - *school* could be a building or a logical institution (ambiguous wrt word sense)
- Several linguistic tests will help us disambiguate between them.

Underspecification vs. Ambiguity

Underspecification:

- *Sue visited her cousin.*

cousin is underspecified wrt [male/female]. Which interpretation applies is (sometimes) inferred from the context:

- *Sue's cousin is pregnant.*

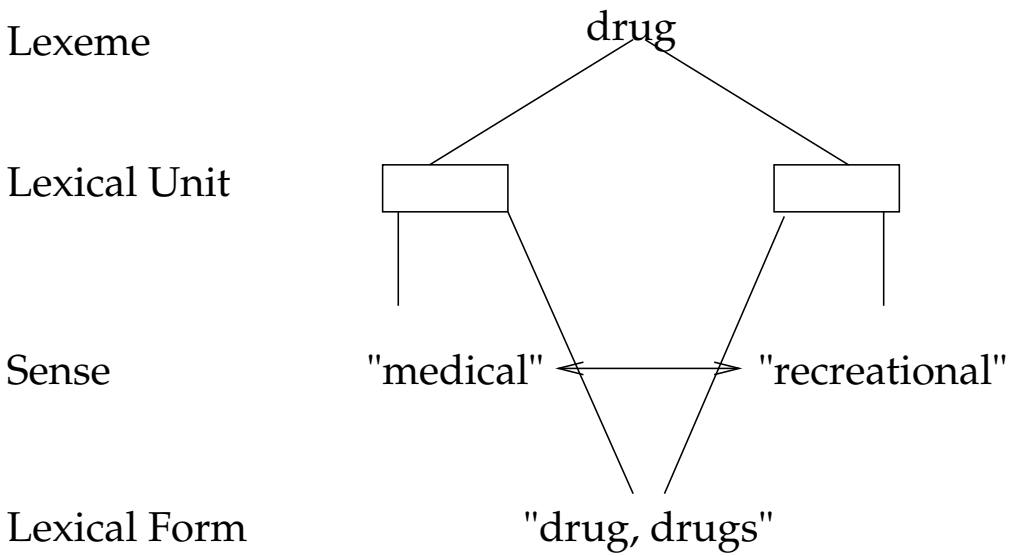
Ambiguity:

- *We finally reached the bank.*

bank has two distinct senses, with no general meaning covering both. Which sense applies is sense selected from the context:

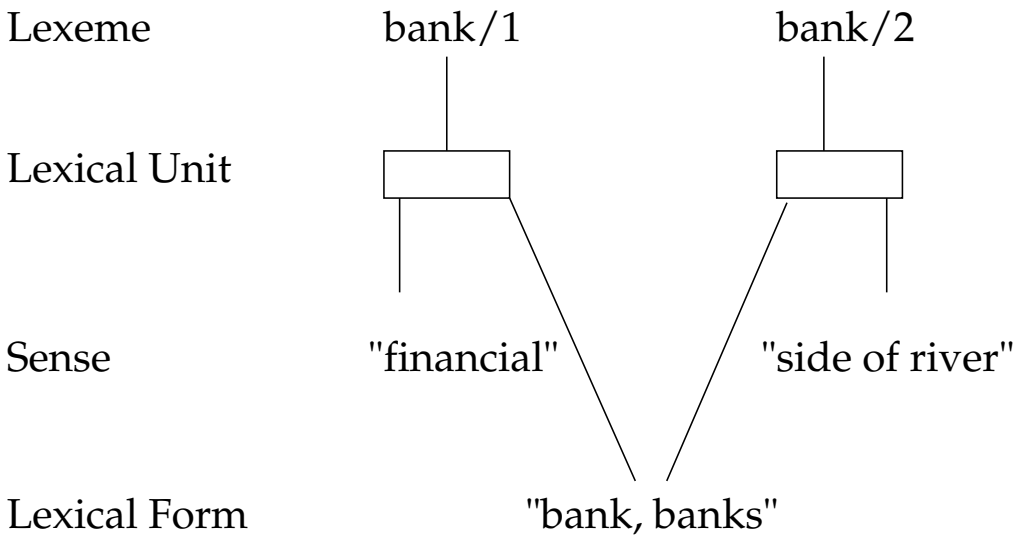
- *The bank is steep and covered with brambles.*

Polysemy (Word Senses)



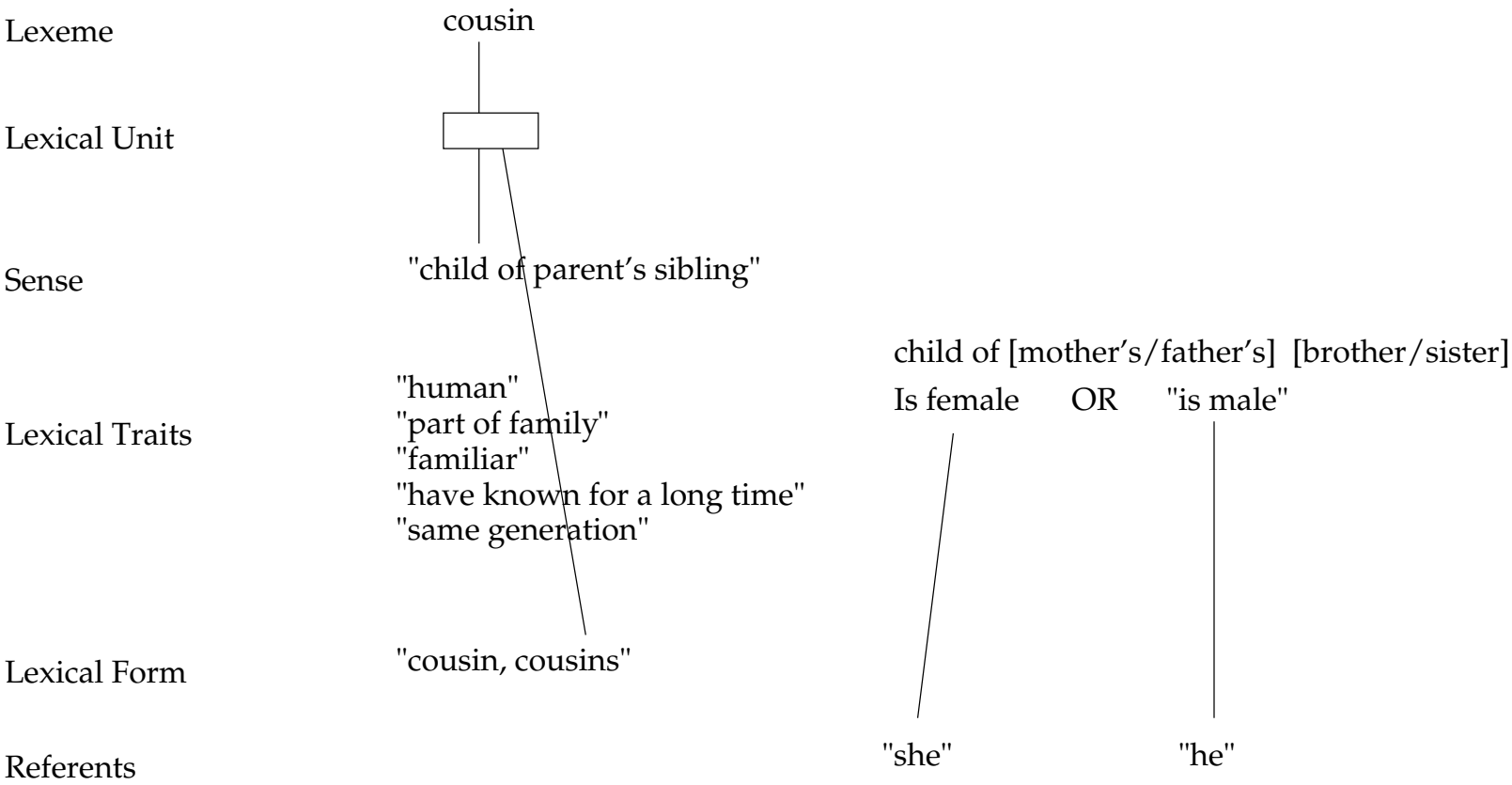
A lexical form which has a number of related word senses is polysemous. Typically, a number of semantic traits is shared between the lexical units, others are not.

Homonymy (Word Senses)



A lexical form which has entirely unrelated word senses is homonymous. In that case, if corresponds to more than one lexeme (lexicon entry). Few semantic traits will be shared.

Underspecification



An underspecified lexical form has only one sense, but a (single) semantic trait that is left open/underspecified.

Crossed Interpretations Test for Ambiguity

If two items of the potentially ambiguous word form occur in a sentence, and if it is possible that two contrary interpretations hold, then the word form is underspecified, not ambiguous.

- *Mary has adopted a child; so has Sue.*
  - YES – one can be a boy, the other a girl → underspecification ("child" does NOT have two senses)
- *Tom has reached the bank; so has Joe.*
  - NO – This can only mean that both reached the same type of bank. → ambiguity ("bank" has two senses)
- *Tom wants to know if this is a dog; so does Joe.*
  - NO – This can only mean that both enquire either about the breed or the sex of the dog. → ambiguity

Zeugma Test for Ambiguity

Ambiguous word forms give rise to zeugma, if more than one sense of an ambiguous word form is activated.

- *? John and his driving licence expired last Thursday.*

Underspecified word forms don't give rise to zeugma:

- *My cousin, who is pregnant, was born on the same day as Arthur's, who is the father.*

Yes/No Test for Ambiguity

- For an ambiguous word form, you can construct a single situation including two entities, one for each sense of the word form, where the statement holds for one of the entities (senses), but not for the other.
- Show that you have done so, by giving a question containing the ambiguous word form, which can be answered both *yes* and *no*, depending on the sense the speaker has in mind.
- It is not possible to construct such a scenario for an underspecified word form.

Yes/No Test for Ambiguity

- *Is that a dog?* [species yes, male dog, no]
  - *Yes, it's a Spaniel.*
  - *No, it's a bitch.*
- *Did Arthur make it to the bank?* [riverbank yes, money bank no]
  - *Yes, he's a strong swimmer.*
  - *No, he was arrested as soon as he came out of the water.*

Yes/no Test fails for Underspecified item

In contrast:

- *Is the subject of this poem a monarch?* [queen yes, king no]
  - *Yes, it's a queen.*
  - *? No, it's a king.*

Indirect Tests for Ambiguity

Word form X is ambiguous if it stands in relation Y with other word forms Z_1 and Z_2 in one occurrence context but not another (and the two contexts exemplify different senses).

Y=Synonymy

- *Guy struck the match.* – lucifer
- *The match was a draw.* – contest

Y=Antonymy

- *The room was painted in light colours.* – dark
- *Arthur has a light teaching load.* – heavy

Y=Paronymy

- *She complained about discrimiation by race.* – racist
- *The race was won by Arthur* – racing.

Types of Polysemy

- Linear polysemy: two word forms are in a systematic semantic relation to each other, and one of them takes on the meaning of the other:
  - dog/canine–male
  - door/part–whole
  - man/male–humankind
  - wheat/plant–food
- Non-linear polysemy (mainly metaphor):
  - *Has Arthur changed his position?*
  - *The ham sandwich asked for the bill.*

Systematic Polysemy

- Apply to all members of a class by default
- Physical object – content:
  - *I was hit on the head by a novel.*
- Unit – type:
  - *I want that shirt.*
- Species – individual
- Animal – meat
- ...

Word Senses: Example *interest*

- *She pays 3% interest on the loan.*
- *He showed a lot of interest in the painting.*
- *Microsoft purchased a controlling interest in Google.*
- *He said nothing of great interest.*
- *It is in the national interest to invade the Bahamas.*
- *I only have your best interest in mind.*
- *Playing chess is one of my interests.*
- *Business interests lobbied for the legislation.*
- *Primary colours can add interest to a room.*

Multilingual aspect of word sense ambiguity

Example: *interest* translated into German

- Zins: financial charge paid for load
- Anteilnahme: curiousness
- Anteil: stake in a company
- Hobby: hobby
- Interesse: all other senses

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Zins; Anteilnahme; Anteil; Hobby; Interesse

Summary of Today

- Proposition, sentence meaning, entailment, semantic traits: chapter 2.
- Normality Judgements and sources of anomaly: chapter 3.
- Semantic traits: chapter 3.
- Sense Ambiguity Tests chapter 6.

- D. A. Cruse, Meaning in Language. Oxford Linguistics Press, 2000. Chapter 6 (plus 1-3 + 5 for terminology and core concepts)