Recap: Language & Linguistics

- ▶ Language: Communication system
  - ▶ Conventionalised relation between signs and meanings
- ▶ Linguistics: Scientific study of language
  - ▶ Phonology/Phonetics: Spoken language
  - ▶ Morphology: Word formation

Linguistic Overview, Part 2

Einführung in die Informationsverarbeitung

Nils Reiter

November 23, 2023

## Subsection 1

Syntax

Syntax

- ▶ Syntax: How are words used to form sentences?
  - ▶ Related to 'grammar'
  - ▶ Two ways to look at syntax
    - ▶ Phrase structure
    - ▶ Dependency (not today)

Phrase Structure

- ▶ Words are not put in any arbitrary order
- ▶ Parts of speech (Wortarten) are not enough to explain sentences

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- ▶ Parts of speech (Wortarten) are not enough to explain sentences
- ▶ Constituents
  - ▶ Words that are grouped together as a unit
  - ▶ What can appear in diff. positions of a sentence is a constituent
    - (1) I put the bagels in the freezer.
    - (2) The bagels, I put in the freezer.
    - (3) I put in the fridge the bagels (that John had given me).
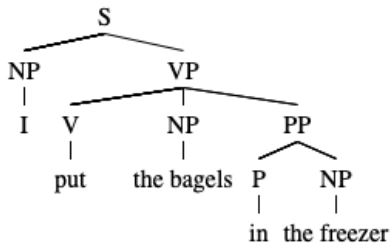
Figure: Phrase structure syntax tree

Phrase Structure

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Examples

(1) $\overbrace{\text{Der \quad flauschige \quad \underbrace{Hund}_{\text{Head}}}}^{\text{Nominal phrase}}$ bellt .

(2) $\overbrace{\text{Die \quad flauschigen \quad \underbrace{Hunde}_{\text{Head}}}}^{\text{Nominal phrase}}$ bellen .

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- ▶ Separable verbs
  - ▶ aufstehen: 'Sie steht jeden Tag früh auf.'
    - ▶ *'Sie aufsteht jeden Tag früh'
  - ▶ bestehen: 'Sie besteht die Prüfung.'
    - ▶ *'Sie steht die Prüfung be.'
  - ▶ Mark Twain: 'The Germans have another kind of parenthesis, which they make by splitting a verb in two and putting half of it at the beginning of an exciting chapter and the other half at the end of it. Can any one conceive of anything more confusing than that?'

German Syntax
Nominal Phrases

NP → Artikel? Adjektiv* Nomen (PP|Relativsatz)*

? 0 oder 1 mal
* 0 mal oder öfter
(|) Alternative

Subsection 2

Semantics

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Truth-conditional semantics   Davidson (1967)

▶ Meaning: Conditions that make a sentence true
  ▶ (we're talking about full sentences now)
▶ Intuitively: If we know what makes a sentence true, we know something about its meaning

What makes a sentence true?
Formal representation

Examples

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▶ A hippo swims.
  ▶ Indefinite article
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Every woman loves a man.

What makes a sentence true?
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Every woman loves a man.

- ▶ Ambiguous: Is it the same man?
- ▶ Ambiguity can be represented by different scopes of the quantors
- ▶ $\forall w : \mathsf{woman}(w) \Rightarrow \exists m : \mathsf{man}(m) \wedge \mathrm{love}(w,m)$
- ▶ $\exists m : \forall w : \mathsf{woman}(w) \Rightarrow \mathsf{man}(m) \wedge \mathrm{love}(w,m)$

Subsection 3

Pragmatics

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  - ▶ Deixis

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    - ▶ Grice: The co-operative principle Grice (1975)

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    - ▶ E.g., the maxim of Quantity
      (i) make your contribution as informative as is required for the current purposes of the exchange
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  - ▶ Presupposition
  - ▶ Speech acts
    - ▶ 'I hereby christen this ship the H.M.S. Flounder.'   Austin (1962)
    - ▶ Change of the state of the world
  - ▶ Conversational structure

Presupposition

Implicit assumptions about the world

Example

(1) John managed to stop in time.

(2) John stopped in time.

(3) John tried to stop in time.

Presupposition
Implicit assumptions about the world

Example

(1) John managed to stop in time.

(2) John stopped in time.

(3) John tried to stop in time.

From (1), we can infer (2) and (3).

Example

(4) John didn't manage to stop in time.

From (4), we cannot infer (2), but (3).

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- ▶ Presuppositions remain stable
- ▶ Where does the presupposition come from?
  - ▶ The word 'manage' – let's replace it by 'try'

Example

(5) John tried to stop in time.

(6) John didn't try to stop in time.

(5) is not presupposed by (6).

Presupposition triggers

- ▶ Some words trigger presuppositions
- ▶ Trigger words have been collected and categorized

Presupposition triggers

- ▶ Definite descriptions
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    - → there exists a man with two heads

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- ▶ Comparisons and contrasts
  - ▶ Marianne called Adolph a male chauvinist, and then HE insulted HER
  - → For Marianne to call Adolph a male chauvinist would be to insult him
- ▶ …

Presupposition properties

▶ So far: Presuppositions
  ▶ are implicit assumptions about the world
  ▶ survive under negation
▶ Now:
  ▶ Defeasibility

Presupposition
Defeasibility

- ► Presuppositions can be cancelled/prevented/defeated

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- ▶ By background knowledge (that John didn't to a PhD)
  - ▶ At least John won't have to regret that he did a PhD.

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    - (1) Sue cried before she finished her thesis.
        - → Sue finished her thesis
        - ▶ 'before' triggers a presupposition

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  - ▶ At least John won't have to regret that he did a PhD.
- ▶ By the meaning of the sentence
  - (1) Sue cried before she finished her thesis.
    - → Sue finished her thesis
    - ▶ 'before' triggers a presupposition
  - (2) Sue died before she finished her thesis.
    - ↛ Sue finished her thesis

Presupposition
Defeasibility

- ▶ By more context
  - (1) He isn't aware that Serge is on the KGB payroll
  - → Serge is on the KGB payroll

Presupposition
Defeasibility

- ▶ By more context
  - (1) He isn't aware that Serge is on the KGB payroll
  - → Serge is on the KGB payroll
    - ▶ A: Well we've simply got to find out if Serge is a KGB infiltrator
      B: Who if anyone would know?
      C: The only person who would know for sure is Alexis; I've talked to him and he isn't aware that Serge is on the KGB payroll. So I think Serge can be trusted
- ▶ A specific discourse context can override a presuppositional inference

Section 1

Sprachliche Informationsverarbeitung

Sprachliche Informationsverarbeitung im (Informationsverarbeitungs)-Studium

Zwei Module

- ▶ Modul Grundlagen der Computerlinguistik (alte Studienordnung "Computerlinguistische Grundlagen")
    - ▶ Seminar Computerlinguistische Grundlagen (immer im WiSe, Dozent Hermes, Inhalt: Linguistische Grundlagen, Annotation)
    - ▶ Vorlesung und Übung Sprachverarbeitung (immer im SoSe, Dozent Reiter, Quantitative Eigenschaften von Sprache, Machine Learning; Übung war früher Seminar II)
- ▶ Modul Anwendungen der Computerlinguistik (alte Studienordnung "Angewandte Linguistische Datenverarbeitung")
    - ▶ Übung Deep Learning (immer im WiSe, Dozentin Nester, Inhalt: Deep Learning Methoden)
    - ▶ Hauptseminar Anwendungen der Computerlinguistik (immer im WiSe, Dozent Reiter, Inhalt: Experimente in der CL, wo kommen Fortschritt und Erkenntnis her?)

Computerlinguistik: Aktuelle Entwicklungen in der Welt

Große Sprachmodelle (ChatGPT & co)

▶ Viel Bewegung, unklare Marktsituation
  ▶ Extrem schnelle (Weiter-)Entwicklungen
▶ Hype != Benchmark-Fortschritt != Erkenntnis
▶ Kommerzielle Entwicklungen intransparent (OpenAI)
  ▶ GPT3.5 ➜GPT4: Nicht mehr Daten, sondern bessere Daten
▶ Neue Anwendungsbereiche: Besseres Textverstehen erlaubt interpretativere Fragen
▶ Gefährlich: Unkritischer Umgang mit Sprachmodell-Output

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- ▶ Literaturwissenschaft
  - ▶ Was hat sich zwischen Epochen eigentlich geändert? Kann man das messbar machen?
  - ▶ Wie unterscheiden sich männliche/weibliche Figuren? Schreiben Autoren anders als -innen?

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- ▶ Musikwissenschaft
  - ▶ Noten als Text: Kann man CL-Verfahren auf Noten anwenden? Was hat man davon?
  - ▶ Wie ist der Zusammenhang zwischen Text und Musik beim Gesang, z.B. Opern?

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  - ▶ Wie kann man Argumentationsstile und -schulen sichtbar, messbar machen?
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- ▶ Methodische Herausforderungen im Allgemeinen
    - ▶ Kombination von symbolischem und statistischem Wissen
    - ▶ Operationalisierung komplexer Konzepte

References I

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