

Grammar

Grammar

- With **phonetic/phonology** and **morphology**, we got two levels of description in the study of language

- Linguistic expressions as sequence of sounds that can be represented in the phonetic alphabet and described in terms of their features

- We can identify a voiced fricative, a voiceless stop and a diphthong as segments in the transcription of a phrase such as

/ðəlʌkɪbɔɪz/

- We can take the same expression and describe it as a sequence of morphemes:

<i>the</i>	<i>luck</i>	<i>-y</i>	<i>boy</i>	<i>-s</i>
functional	lexical	derivational	lexical	inflectional

- Hence, we could **characterize all the words and phrases** of a language in terms of phonology and morphology

English grammar

- The words in *the lucky boys*, however, can only be combined in a particular sequence
- The following two phrases are not well-formed
 - *boys the lucky and *lucky boys the
 - * indicates an ungrammatical form
- We need to follow strict rules for combining words into phrases
 - The **article** (*the*) must go before the **adjective** (*lucky*), which must go before the **noun** (*boys*)
 - Grammatical -> article + adjective + noun
- The process of describing the structure of phrases and sentences in such a way to get all grammatical sequences in a language defines the **grammar** of a language

Traditional grammar

- The terms **article**, **adjective** and **noun** for grammatical categories come from traditional grammar, originating from the description of languages such as Latin and Greek
 - Used as model for other grammars
- Several inherited terms from that model used in describing these basic grammatical components
 - "*part of speech*" , and how they connect to each other in terms of "*agreement*"

Parts of speech and agreement

- Each *part of speech*, or *word class*, can be illustrated as follows

The *lucky* *boys* *found* *a* *backpack* *in*
article adjective noun verb article noun preposition

the *park* *and* *they* *opened* *it* *carefully*
article noun conjunction pronoun verb pronoun adverb

- In addition, traditional grammatical analysis provides a few more categories, ***number***, ***person***, ***tense***, ***voice*** and ***gender***
 - Can be discussed in isolation or, usefully in discussing language structure, in terms of ***agreement***

female gender
Cathy loves **her** dog
third person, present

Let's ask an expert.
first person, future non-binary gender
We'll benefit from **their** advice.

Describing the structure of a language

- To describe the structure of a language a *prescriptive approach* could be followed or a
- **Descriptive approach**
 - Collects samples of the target language for attempting to describe regular structures of that language as it is used
 - Not according to some view of how it should be used
- There are two types of descriptive approach
 - **Structural analysis**
 - Investigates the distribution of forms in language
 - Adopts “test-frames”, i.e., could be sentences with empty slots
 - **Constituent analysis**
 - It is designed to show how small constituents (or components) go together to form larger constituents

Structural analysis

- Test-frame examples
 - *The _____ makes a lot of noise.*
 - *I heard a _____ yesterday.*
- Possible forms fitting those frames are
 - *"car", "child", "donkey", "dog", "radio"*
 - Examples of same grammatical category, a "noun" (N)
- Forms not fitting those frames need different test-frames
 - _____ *makes a lot of noise*
 - *I heard _____ yesterday*
 - *"It", "the big dog", "an old car", "Francesco Camastra, the professor with the northern accent"*
 - Examples of the grammatical category, noun phrase (NP)

Constituent analysis

- One basic step is determining how words go together to form phrases
- Example
 - *The old woman brought a large snake from Brazil* (9 constituents)
 - The phrase-like constituents are combinations of the following types
 - *The old woman*, *a large snake*, *Brazil* (noun phrases), *from Brazil* (a prepositional phrase) and *brought* (a verb)
 - The analysis of the constituent structure of the sentence can be represented as

The	old	woman	brought	a	large	snake	from	Brazil

Distribution of constituents

- This way, we can determine the types of forms that can be substituted for each other at different levels of constituent structure

Constituent analysis

- Example
 - Pronouns (*she*, *it*) and proper nouns (*Brazil*) can be used as noun phrases and fill the same constituent space as longer phrases (e.g., *the old woman* or *a large snake*)

Noun phrase	Verb	Noun phrase	Prepositional phrase
The old woman She	brought kept	a large snake it	from Brazil in a cage

Constituent analysis

Subjects and Objects

- From the previous analysis we can also understand the different grammatical functions of constituent phrases
 - The term **noun phrase** is used to describe the form of the expression (i.e., it has a noun or a pronoun in it)
 - **Subjects** and **objects** are terms used to describe the different functions of noun phrases in a sentence
- English uses position in the sentence to indicate grammatical function, so we identify
 - the **subject** as the first noun phrase before the verb and
 - the **object** as the noun phrase after the verb
 - The other phrase at the end of our example sentence is an **adjunct** (often a prepositional phrase)

Subjects	Objects
• the first noun phrase	• the noun phrase after the verb
• controls the verb (singular or plural)	• no influence on verb
• often performs the action	• often undergoes the action
• pronouns: <i>I, he, she, we, they</i>	• <i>me, him, her, us, them</i>

Word order

- The basic linear order of constituents in English is
 - Noun Phrase-Verb-Noun Phrase (NP V NP)
- And their typical grammatical functions are Subject-Verb-Object (SVO)
- These type of analysis is discussed in terms of word order
- The English word order sequence is not the only possible or even the most common

(SVO)	Subject	Verb	Object
	NP	V	NP
English	<i>John</i>	<i>saw</i>	<i>the big dog</i>
(SOV)	Subject	Object	Verb
	"John"	"big dog"	"saw"
Japanese	<i>Jon ga</i>	<i>ookii inu o</i>	<i>mita</i>
(VSO)	Verb	Subject	Object
	"Saw"	"John"	"the dog big"
Gaelic	<i>Chunnaic</i>	<i>Iain</i>	<i>an cu mor</i>
(VOS)	Verb	Object	Subject
	"Saw"	"the dog big"	"John"
Malagasy	<i>Nahita</i>	<i>ny alika be</i>	<i>Rajaona</i>

Syntax

Syntax

- We humans tend to interpret sentences on an expected structure
 - When we arrive at an unsound interpretation we go back and try to use a different structure
 - Recognizing the underlying structures of sentences to make sense of them

Time flies like an arrow

Fruit flies like a banana

Syntax

- When we concentrate on the structure and ordering of components within a sentence, we're studying the **syntax** of a language
- Earlier approach
 - Attempt to produce an accurate description of the sequence or ordering of elements in the linear structure of the sentence
- Modern approach
 - Focus on the underlying rule system that we use to produce or "generate" sentences
- The goal is to have a small and finite set of rules capable of producing a large and potentially infinite number of well-formed structures (generative grammar)

Syntactic analysis

- In syntactic analysis some conventional abbreviations for the **part of speech** and for **phrase** are used
 - POS: **N** (= noun), **Art** (= article), **Adj** (= adjective), **V** (= verb)
 - Phrase: **NP** (= noun phrase), **VP** (= verb phrase)
- A verb phrase (VP) **consists of** the verb (V) plus the following noun phrase (NP)
- Example

NP	VP	
	V	NP
<i>John</i>	<i>saw</i>	<i>the big dog</i>

Static analysis of a simple sentence

Figure 8.1 Sentence structure

Syntactic Analysis

- Turning to a more **dynamic format**, we could represent the concept “**consists of**” with an arrow (**->**) (also interpreted as “**rewrites as**”)
- A set of rule to create English phrases could be

$NP \rightarrow \text{Art (Adj) N}$

$NP \rightarrow \text{Pro}$

$NP \rightarrow \text{PN}$

$NP \rightarrow \{\text{Art (Adj) N, Pro, PN}\}$

- Or in more compact way **NP -> {Art (Adj) N, Pro, PN}**

Phrase structure rules

- The structure of a phrase of a specific type will consist of one or more constituents in a particular order
- Let' consider a set of simple (yet incomplete) **phrase structure rules**
 - **$S \rightarrow NP VP$**
 - means "a sentence (S) rewrites as a noun phrase (NP) and a verb phrase (VP)"
 - **$NP \rightarrow \{Art (Adj) N, Pro, PN\}$**
 - "a noun phrase (NP) rewrites as either an **article** plus an **optional adjective** plus a **noun** or a **pronoun** or a **proper noun**"
 - **$VP \rightarrow V NP$**
 - "a verb phrase rewrites as a verb plus a noun phrase"

$S \rightarrow NP VP$

$NP \rightarrow \{Art (Adj) N, Pro, PN\}$

$VP \rightarrow V NP$

Lexical rules

- Phrase structure rules generate structures and to turn the structures into recognizable English, we need lexical rules
 - Lexical rules specify which words can be used when we rewrite constituents such as PN

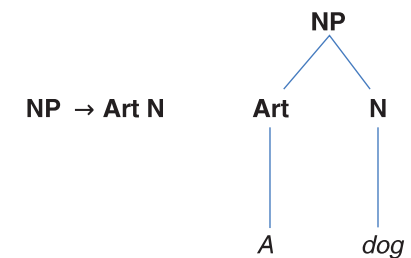
$PN \rightarrow \{John, Mary\}$	$Art \rightarrow \{a, the\}$
$N \rightarrow \{girl, dog, boy\}$	$Adj \rightarrow \{big, small\}$
$V \rightarrow \{followed, helped, saw\}$	$Pro \rightarrow \{it, you\}$

- These rules make it possible to generate grammatical sentences

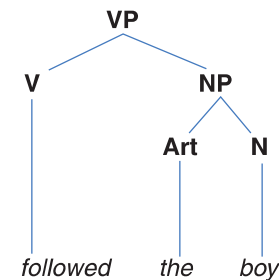
(1) <i>A dog followed the boy.</i>	(7) <i>*Dog followed boy.</i>
(2) <i>You saw it.</i>	(8) <i>*You it saw.</i>
(3) <i>John saw the big dog.</i>	(9) <i>*John Mary small dog</i>
(4) <i>It followed Mary.</i>	(10) <i>*Followed Mary the dog big.</i>
(5) <i>The small boy helped you.</i>	(11) <i>*The helped you boy</i>
(6) <i>Mary helped John.</i>	(12) <i>*Mary John helped.</i>

Tree diagrams

- A tree diagram is a way to create a visual representation of underlying syntactic structure
- It shows that there are different levels in the analysis
 - A level at which a constituent (e.g., NP) is represented
 - A different lower level at which a constituent such as N is represented

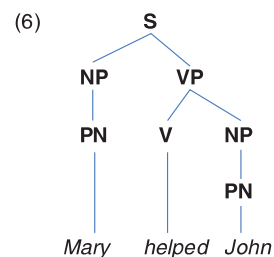
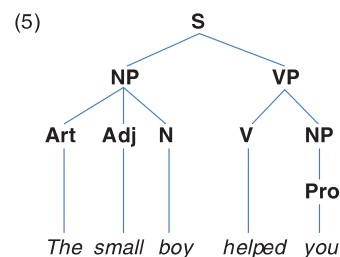
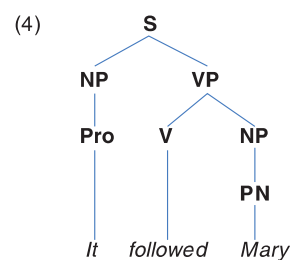
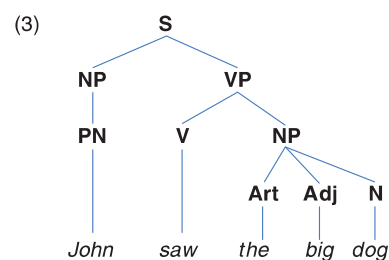
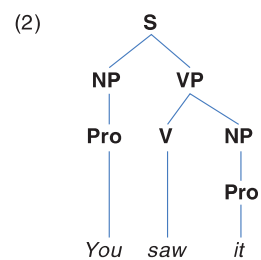
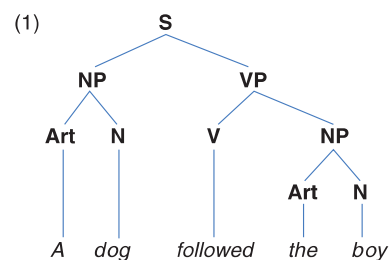


Noun phrase tree diagram



Verb phrase tree diagram

Tree diagrams of English Sentences

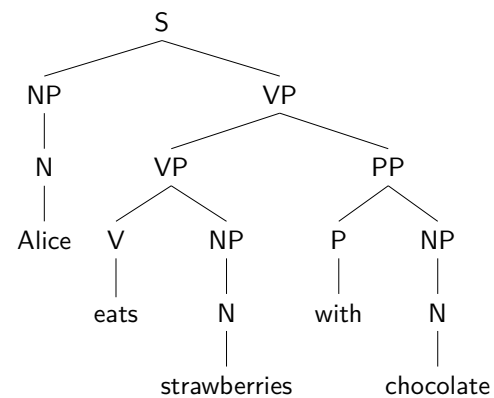
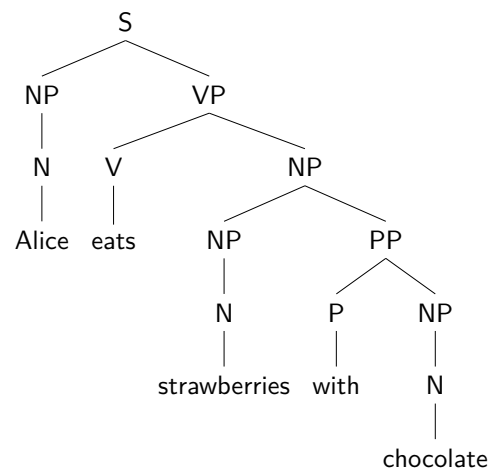


- (1) *A dog followed the boy.*
 (2) *You saw it.*
 (3) *John saw the big dog.*
 (4) *It followed Mary.*
 (5) *The small boy helped you.*
 (6) *Mary helped John.*

Tree diagrams of English sentences

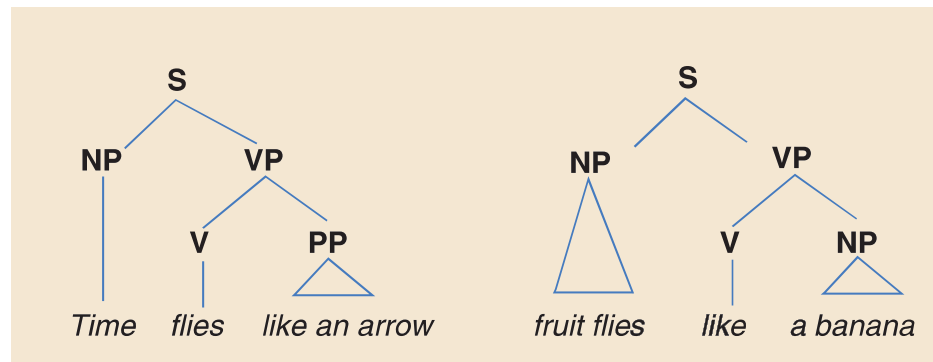
Syntactic ambiguity

- A sentence can be assigned more than one syntactic structure
 - Example : "*Alice eats strawberries with chocolate*"



Still on syntactic ambiguity

- Example: "*Time flies like an arrow; fruit flies like a banana*"
- The different structures depend on some **lexical ambiguity**
 - **Flies** is a **verb** in the first part and a **noun** in the second part
 - **Like** is a **preposition** in the first part and a **verb** in the second part





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Semantics

Meaning

- Semantics is the study of meaning in language
- We can distinguish between **referential meaning**
 - Components of meaning that are conveyed by the literal use of a word
 - Think of dictionary definitions of words
- As opposed to **associative** or **emotive meaning**
 - Feelings or reaction to words that may be found among some individuals or groups but not others
- Example: The word **needle**
 - some basic components might include “**thin, sharp, steel instrument**”
 - however, different people might have different associations attached to the word **needle**
 - “**pain**”, “**illness**”, “**blood**”, “**drugs**”, “**thread**”, “**knitting**”, “**hard to find**”

Meaning

- Referential meaning may help to account for the “oddness” when one reads some sentences

The hamburger ate the boy.

The table listens to the radio.

The horse is reading the newspaper.

- All the sentences are syntactically good, but semantically odd
 - The kind of noun used with ate must denote a living or “animate” entity that is capable of eating

Semantic features

- The meaning of the word can be analyzed in terms of **semantic features**
 - *Boy* has the feature [+animate] and [+human], while *horse* [-human]
- We can characterize which semantic feature is required in a noun to appear as the subject of a particular verb
 - hence, predicting which nouns (*boy*, *hamburger*, *horse*) would fit in a sentence appropriately and which would be odd

The _____ ate all the food.

N [+ animate]

The _____ is reading the newspaper.

N [+ human]

Componential analysis

- Features such as [+human] or [+adult] can be treated as basic elements or components of meaning in the approach called **componential analysis**

	boy	girl	man	woman
human	+	+	+	+
adult	-	-	+	+
female	-	+	-	+

- This approach is not without problems
 - For many words it may not be easy to determine components of meaning
 - Think of nouns *advice*, *threat* and *warning*
 - This is because the words are treated as a sort of containers the carry meaning components

Semantic roles

- Instead of viewing words as containers of meaning, we can look at the **roles** they play within the situation described by a sentence
- Let's consider a simple event as in "*The boy kicked the ball*"
 - The **verb** describes an action (*kick*)
 - The **noun phrases** describe the roles of entities (people and entities) involved in the action
 - We can identify a small number of **semantic roles** for these noun phrases
- "*The boy kicked the ball*"
 - the NP *the boy* is the **entity** that performs the action (**agent**)
 - *The ball* is another role, the entity that is involved in or affected by the action (**theme**)
 - The theme can also be an entity that is simply being described (e.g., *The ball was red*)

Semantic roles

- Agents (typically human) can also be non-human entities that cause actions

(1) *The boy kicked the ball.*

(2) *The wind blew the ball away.*

(3) *A car ran over the ball.*

(4) *The dog caught the ball.*

(5) *The dog chased the boy.*

- The theme is typically non-human, but can be human (the boy), as in sentence (5)

Semantic roles

- If an agent uses another entity to perform an action, the latter fills the role of **instrument**
 - *The boy cut the rope with an old razor*
 - *He drew the picture with a crayon*
 - *with* is a clue to discover **instruments** in English
- When a noun phrases is used to designate an entity as the person who has a feeling, perception o state, it plays the role of **experiencer**
 - If we *feel*, *know*, *hear* or *enjoy* something, we're not performing an action (hence we are not agents)
 - *The woman feels sad*
 - *Did you hear that noise?*

Semantic roles

- A few semantic roles designate **where** an **entity** is in the description of an event
 - Where an **entity** is (*on the table, in the room*) play the role of **location**
 - *We drove from Chicago to New Orleans*
 - Where the **entity** moves from is the **source** (*from Chicago*)
 - Where it moves to is the **goal** (*to New Orleans*)

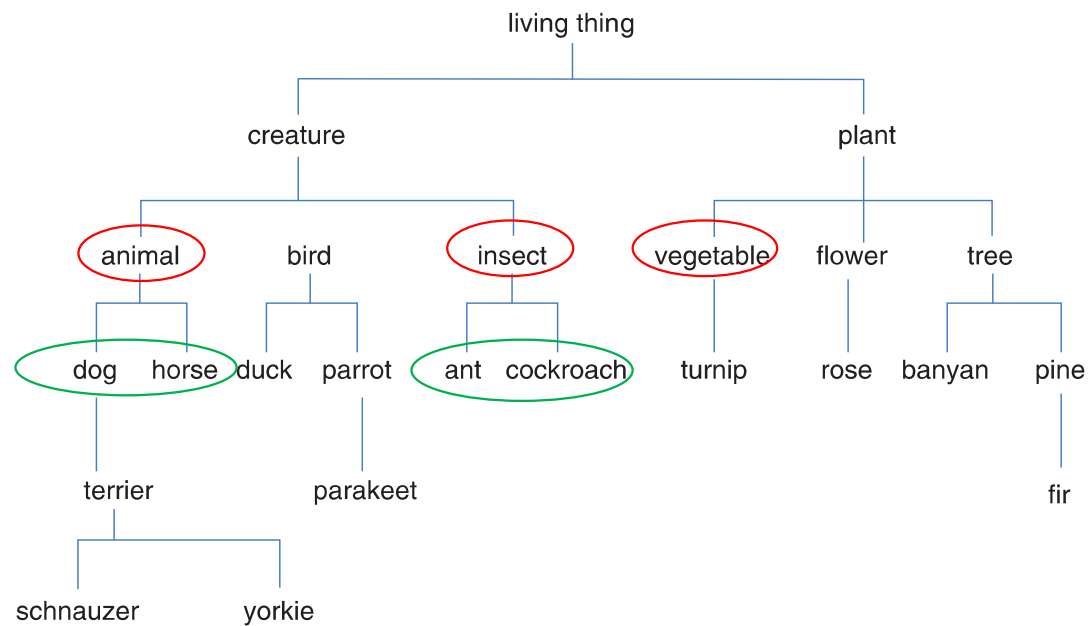
Mary	saw	a fly	on the wall.
EXPERIENCER		THEME	LOCATION
She	borrowed	a magazine	from George.
AGENT		THEME	SOURCE
She	squashed	the bug	with the magazine.
AGENT		THEME	INSTRUMENT.
She	handed	the magazine	back to George.
AGENT		THEME	GOAL
"Gee thanks,"	said	George.	
		AGENT	

Lexical relations

- Words can also have “relationships” with each other
 - To explain *conceal*, we might say “*It’s the same as hide*”
 - *Shallow* could be explained as “*the opposite of deep*”
 - *Pine* is “*a kind of tree*”
- This approach is used for the semantic description of a language and is known as analysis of **lexical relations**
- The lexical relations above are
 - **synonymy** (*conceal/hide*): Two or more words with very closely related meanings
 - **antonymy** (*shallow/deep*): Two forms with opposite meanings
 - **hyponymy** (*pine/tree*): When the meaning of one form is included in the meaning of another

Hyponymy

- Superordinate
- Co-hyponyms



Lexical relations

- Homophones

- When two or more different (written) forms have the same pronunciation
 - To/too/two, right/write, flour/flower

- Homonyms

- When one form (written or spoken) has two unrelated meanings
 - Bat (flying creature) – bat (used in sports); race (contest of speed) – race (ethnic group)

- Polysemy

- Two or more words with the same form and related meanings
 - Head (object on top of your body, froth on top of a glass of beer, person at the top of a company or department)
 - Foot (of a person, of a bed, of a mountain)

Collocation

- A mature speaker of a language knows which words tend to occur with other words
 - Asking people what they think of when one says *hammer*, the most will say *nail*, similarly, *table* let's us think of *chair* or *needle* elicits *thread*, or *salt* elicits *pepper*
- In other words, one way to organize our knowledge of words is simply based on **collocation**, or frequently occurring together
- In recent years more attention has received **Corpus linguistics**
 - It focuses on the study of which words occur together, and their frequency of co-occurrence
- A corpus is a large collection of texts, spoken or written, to find out how often specific words or phrases occur and what type of collocation are most common

Collocation

- A **concordance** is a listing of each occurrence of a word (or phrase) in a corpus, along with the words surrounding it
- The word being studied is described as the "**key word in context**"
 - Example: key word = "**sarcastic**"

1 I can't without being a bit **sarcastic** or rude. I'll simply photocopy and submit
2 to me – I mean if they were being **sarcastic** or rude, I think I would have noticed
3 don't wish to come across as rude, **sarcastic** or condescending. It does make
4 someone who is hotheaded rude **sarcastic** tactless won't give an inch etc. All your words
5 become more and more **sarcastic**, rude, whatever, until I respond. He's with some
6 words like rude, abusive and **sarcastic** keep cropping up when people deal with them
7 what comes out of her mouth is rude, **sarcastic** and downright mean it's hard to cope
8 demonstrative and hateful, rude, **sarcastic** and aggressive, I have very little support
9 customer service was very rude and **sarcastic**. Finally we had enough and said we
10 giving them an acerbic or **sarcastic** response is rude unless they were snarling in

- This type of research provides more evidence that our understanding of what words and phrases mean is tied to the context in which they are typically used