

CSC 594 Topics in AI – Applied Natural Language Processing

Fall 2009/2010

3. Outline of English Syntax

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Word/Lexical Categories

- Four 'main' classes of words:
 - Nouns:** refer to objects, concepts etc. (e.g. "birds")
 - Verbs:** express action in the sentence (e.g. "sing")
 - Adjectives:** describe properties of nouns (e.g. "yellow")
 - Adverbs:** modify verbs (e.g. "slowly")
- Other classes
 - pronouns, prepositions, determiners, particles, conjunctions etc.

John ate the cake with a spoon
N V Det N Prep Det N

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Syntactic Phrases

- A phrase is composed of several (but ≥ 1) words.
- The **head** of a phrase indicates the syntactic type of the phrase.
 - Noun phrase, Verb phrase, Adjective phrase, Adverbial phrase
 - Other words in a phrase which complete the meaning of the head word are called **complements**.

Noun Phrases The president of the company His desire to succeed Several challenges from the opposing team	Verb Phrases looked up the chimney believed that the world was flat ate the pizza
Adjective Phrases easy to assemble happy that he'd won the prize angry as a hippo	Adverbial Phrases rapidly like a bat intermittently throughout the day inside the house

Figure 2.1 Examples of heads and complements

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Source: James Allen "Natural Language Understanding"

Noun Phrases (1)

- Noun Phrases (NPs) refer to things: objects, places, concepts, events, qualities, etc.
- The simplest NP consists of:
 - a single pronoun – “he”, “she”, “it”, “they”, “them” etc.
 - a name or **proper noun** – “John”, “Chicago”
 - a **compound noun** (made of > 1 word) denoting a proper noun – “New York”
- Excluding pronouns and proper names, the head of a noun phrase is usually a **common noun**... and usually the right-most one in a compound noun in English
 - “cakes”, “the cake”
 - “a large chocolate cake”
 - “Harry Potter book reviews”

Source: James Allen “Natural Language Understanding”

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Noun Phrases (2)

- In addition to a head, A noun phrase may contain:
 - specifiers – ordinals (e.g. “first”, “second”), cardinals (e.g. “one”, “two”), and determiners.
 - qualifiers – adjectives (e.g., “angry”), noun modifiers.
- A simple noun phrase may have at most one determiner, one ordinal, and one cardinal.
 - e.g. “the first three contestants”

Source: James Allen “Natural Language Understanding”

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Inflectional Forms of English Nouns

- Number – singular, plural
- Person – first, second, third
- Gender – masculine, feminine, neuter
- Case – nominative (subject), accusative (object), genitive (possessive)

Examples of Pronouns

Case	Number	Person		
		1st	2nd	3rd
Nom	sg	I	you	he (mas), she (fem), it (neu)
	pl	we	you	they
Poss	sg	my	your	his (mas), her (fem), its (neu)
	pl	our	your	their
Acc	sg	my	you	him (mas), her (fem), it (neu)
	pl	us	you	them

Source: James Allen “Natural Language Understanding”

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Grammatical cases of English Nouns

In grammar, the **case** of a noun or pronoun indicates its grammatical function in a greater phrase or clause; such as the role of subject, of direct object, or of possessor.

- **Nominative** -- subjective case, indicates the subject of a finite verb:
 - *We went to the store.*
- **Accusative** -- objective case, indicates the direct object of a verb:
 - *The clerk remembered **us**.*
- **Dative** -- indicates the indirect object of a verb:
 - *The clerk gave **us** a discount.*
- **Genitive** -- possessive case, indicates the possessor of another noun:
 - ***John's** book was on the table.*

Source: Wikipedia

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Verb Phrases (1)

- Verb Phrases (VPs) describe an action, event or state.
- A simple VP may consist of some adverbial modifiers followed by the head verb and its complements.
- Every verb must appear in one of the five possible forms:

Form	Examples	Example Uses
base	hit, cry, go, be	Hit the ball! I want to go.
simple present	hit, cries, goes, am	Her dog cries every day. I am thirsty.
simple past	hit, cried, went, was	Her dog cried all day yesterday. I was thirsty.
present participle	hitting, crying, going, being	Her dog is crying now. Being good is hard for me.
past participle	hit, cried, gone, been	I have been there before. He has gone home.

Source: James Allen "Natural Language Understanding"

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Verb Phrases (2)

- Classes of verbs:
 - Auxiliary verbs – "be", "do", "have"
 - Modal verbs – "can", "will", "shall", "must" etc.
 - Main verbs – e.g. "cry", "hit"
- The tense (of a sentence) – identifies when the proposition was true.

Tense	The Verb Sequence	Example
simple present	simple present	He walks to the store.
simple past	simple past	He walked to the store.
simple future	will + infinitive	He will walk to the store.
present perfect	have in present + past participle	He has walked to the store.
future perfect	will + have in infinitive + past participle	I will have walked to the store.
past perfect (or pluperfect)	have in past + past participle	I had walked to the store.

Figure 2.7 The basic tenses

Source: James Allen "Natural Language Understanding"

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Transitivity of Verbs

- Transitivity of a verb refers to the number of object noun phrases it can take.
 - **Intransitive** – no object NP. e.g. "laugh"
 - "She laughed."
 - (*) "She laughed me." – (*) represents ungrammatical
 - "She laughed at me." – "at me" is not a noun phrase
 - **Transitive** – one object NP. e.g. "write"
 - (*) "She wrote." – must say what she wrote
 - "She wrote a book."
 - **Ditransitive** – two object NPs. e.g. "give"
 - "She gave me the book."
 - Ditransitive sentences can be re-written by transitive sentences.
 - "She gave the book to me."

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Active vs. Passive Sentences

- An active sentence with a transitive/ditransitive verb can be re-written by a passive sentence.

Active Sentence	Related Passive Sentence
Jack saw the ball.	The ball was seen by Jack.
I will find the clue.	The clue will be found by me.
Jack hit me.	I was hit by Jack.

Figure 2.10 Active sentences with corresponding passive sentences

Source: James Allen "Natural Language Understanding"

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Prepositional Phrase Complements

- Many verbs require complements that involve a specific **prepositional phrase (PP)**. e.g.
 - "give" takes an NP and a PP with "to":
 - Jack gave the book to Mary.
 - (*) Jack gave the book from Mary.
 - "put" takes a PP that describes a location:
 - Jack put the book on the desk.
 - Jack put the book there.
 - (*) Jack put the book with a knife.
- A sentence with multiple PPs are often ambiguous (so-called "*PP attachment problem*")
 - I saw a man on the hill with a telescope.

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