Syntactic Representation of Sentences

Formal Language $\mathcal{L}$ defined through a set of elementary objects (e.g. strings of symbols such as words) and a set of rules to combine these elements, i.e. Formal Grammar $\mathcal{G}$

References: Manning et al. (1999); Chomsky (2002); De Saussure (2006); Jurafsky and Martin (2009); McDonald and Nivre (2011)

Context-Free Grammars (CFG)
a.k.a.
Phrase-Structure Grammars (PSG)
Chomsky (1956)

Assumption: formal grammar $\mathcal{G}$ is based on rules, called *rewrite rules*, to operate on syntactic categories without considering the context in which the rules are employed

Sentence is a *parse tree* with leaves corresponding to words, root node corresponding to the abstract syntactic category S for the whole sentence and internal nodes corresponding to the syntactic categories resulting from the application of rewrite rules from S to words

References: Manning et al. (1999); Jurafsky and Martin (2009)

Lexicalized Grammars

Assumption: formal grammar $\mathcal{G}$ is defined on *lexicon*, that associates syntactic categories to lexical entries

Sentence is a *parse tree* with leaves corresponding to words, root node corresponding to the abstract syntactic category S for the whole sentence; the tree is obtained combining lexical entries, i.e. words to which a syntactic category has been associated according to the context in which they appear

- **Categorial Grammars**
  Ajdukiewicz (1935)
- **Tree-Adjoining Grammars (TAG)**
  Joshi et al. (1975)
- **Lexical-Functional Grammars (LFG)**
  Kaplan et al. (1982)
- **Head-Driven Phrase Structure Grammars (HPSG)**
  Pollard and Sag (1994)

References: Manning et al. (1999); Jurafsky and Martin (2009)
Additional Readings: Steedman (1989); Joshi (1985)

Dependency Grammars
Tesnière (1959)

Assumption: formal grammar $\mathcal{G}$ is a set of *head-dependent relations*, binary relations associated to specific syntactic roles and acting directly on words to define the grammatical relation of a word (*dependent*) with respect to another (*head*)

Sentence is a *dependency tree* where each node represents a word and each arc is labelled according to the syntactic role the child node (*dependent*) has with respect to the parent (*head*)

Examples: Word Grammar (Hudson (1984)), Meaning-Text Theory (Mel'čuk (1988)), Functional Generative Description (Sgall et al. (1986)), DEPENDABLE (Choi et al. (2015))

References: McDonald and Nivre (2011)

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