Mathematical Logics
Introduction*

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Outline

1. Mental, computational and logical models
2. Language
3. Logical modeling
4. Why logic? Formal and informal languages/ models

Language

- A (usually finite) set of symbols (elements of the alphabet) and formation rules to compose them to build "correct sentences" (usually unbound in length, still finite). For instance, in logic:
  - Monkey and GetBanana are symbols (atomic sentences)
  - Monkey $\wedge$ GetBanana is a sentence (rule: A $\wedge$ B)
- There are many types of languages:
  - Natural languages (e.g., Italian, English, …)
  - Data languages (e.g., ER, UML, ...)
  - Programming languages (e.g., SQL, Java, C+, ...)
  - ... and formal languages

Language = syntax + semantics

- Syntax - the way a language is written:
  - Syntax is determined by a set of rules saying how to construct the expressions of the language from the set of atomic tokens (i.e., terms, characters, symbols)
  - The set of atomic tokens is called alphabet of symbols, or simply the alphabet)
- Semantics - the way a language is interpreted:
  - It determines the meaning of the syntactic constructs (expressions), that is, the relationship between syntactic constructs and the elements of some universe of meanings, which may or may not be formalized.

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