1-Modeling

1.6-Using formal models

UNIVERSITÀ
DI TRENTO

DataScientia
Unitas per Varietatem

1.6-Using Models

1. Levels of formalization

2. Using logic

- Informal languages
- Semi-formal languages
- Formal languages

1.6.1-Levels of formalization

Lecture index

Specification models (notion)

Notion 1 (Types of specification models) There are various types of specification models depending on the language they use:

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- **Informal models** - use natural language
- **Semi-formal models** - use structured languages with (semi)formal syntax and informal semantics
- **Logical models** - use formal (logical) languages

Levels of formalization (Example)
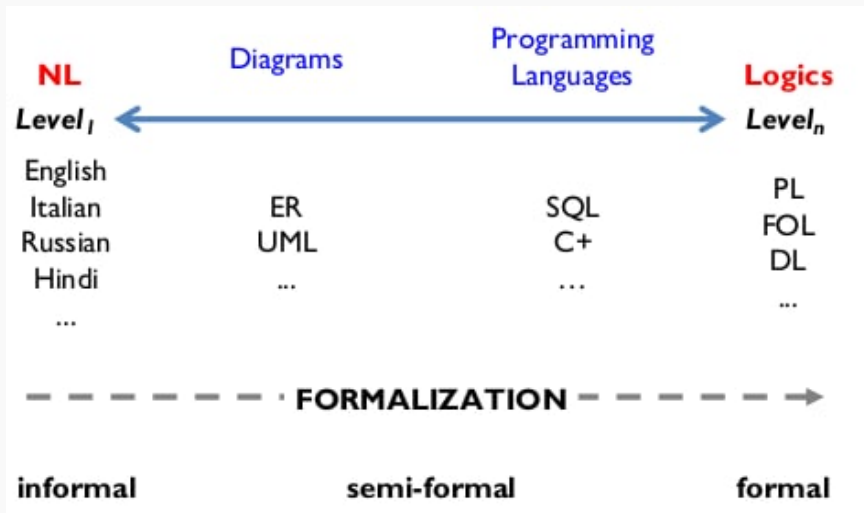
Languages with formal syntax (Example)

In the **Entity-Relationship(ER) Model** the alphabet is a set of graphical objects, that are used to construct schemas(the sentences)

Example of sentences are:

Why informal languages?

Used for	Advantages	Disadvantages
Informal specification	Cheaper to use (Often used at the very beginning of problem solving, when we need a direct, "flexible", well-understood language and the problem is still largely unclear) Useful to interact with users	Semantics is informal, (largely ambiguous, possible misunderstandings) Pragmatically inefficient for automation

Why diagrams?

Used for	Advantages	Disadvantages
Semi-formal specification (to provide more structured and organized specification than natural languages)	Cheap to use (Largely structured and organized; usually used in representation with unified languages when things are non-trivial or when more precision is required w.r.t. Natural Language) Useful to interact with users	Semantics is informal (largely ambiguous, possible misunderstandings) Pragmatically inefficient for automation

Why Logic?

Used for	Advantages	Disadvantages
Formal specification	Well-understood with formal syntax and formal semantics: we can better specify and prove correctness/completeness ...	Hardly usable to interact with users Costly
Automation	Pragmatically efficient for automation exploiting the explicitly codified semantics: reasoning services (building AI)	Effectiveness to be compared with Machine learning

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