Modeling

Representation

UNIVERSITÀ
DI TRENTO

DataScientia
Unitas per Varietatem

Representation

1. Mental representation
2. Representation
3. Modeling

- Mental representation (reprise)
- Representation

1.1.2-Representation

Lecture index

Mental representation (reprise)

Notion 1 (Mental representation) A mental representation is constructed by the mind, inside the mind of each and any human, and it is not accessible to anybody else.

Mental representation (remarks)

- There are infinitely many mental analogical representations that describe the same real world situation;
- There are infinitely many mental linguistic representations for the same analogical representation;
- All mental representations are partial and approximate;
- Different mental representations may be mutually inconsistent;
- Quite often we confuse the world with our mental representation about it;
- Most of time we assume that our own mental representation of the world is the same as that of the others;
- Quite often the above assumption is wrong.

Mental representation (questions)

- Are there any means to guarantee that the mental representations of different people are the same?
- Is this problem relevant to Computer Science (CS)? Can you come up with some examples?
- Is this problem relevant to Data Science (DS)? Can you come up with some examples?
- Is this problem relevant to Artificial Intelligence (AI)? Can you come up with some examples?
- Are there any means to minimize the difference among two or more mental representations, as held by different people?
- Are there any means to minimize the difference among two or more mental representations, as held by a person and a Robot or program?
- Are there any means to minimize the difference among two or more mental representations, as held by a person and two robots or programs?
- Is this problem relevant to CS/ DS/ AI?

Representation (notion)

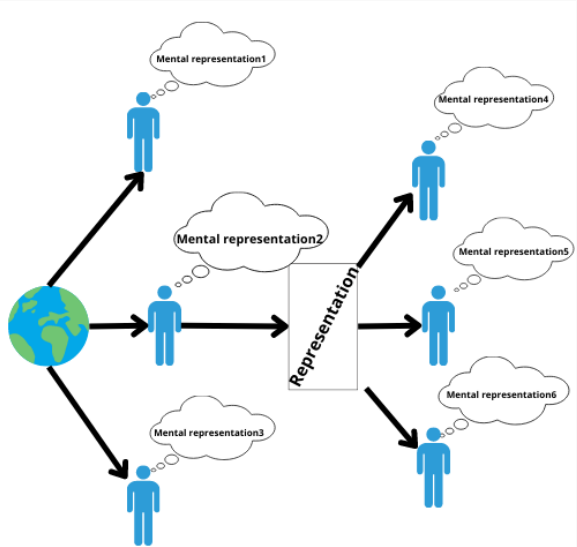
Notion 2 (Representation) A representation has two main properties:

- multiple humans perceive it (thus generating corresponding mental representations);
- it is a part of the world which describes it (the world itself), meaning that there is a correspondence between what is the case in the world and the contents of the mental representations generated by perceiving it.

Notion 3 (Analogical representation) Analogical representations **depict** the world. By depicting we mean that there is a **one-to-one mapping** between their contents and what is the case in the world.

Notion 4 (Linguistic representation) Linguistic representations **describe** the world. By describing we mean that there is a **one-to-one mapping** between their contents and what is the case in analogical representations. They are said to **denote** the analogical representation they represent.

Representation vs Mental representation (notion)



Representation and mental representation (example)

> **Example 1 (*The Monkey and the Bananas* problem by McCarthy, 1969)** ... There is a monkey in a laboratory with some bananas hanging out of reach from the ceiling. A box is available that will enable the monkey to reach the bananas if he climbs on it. The monkey and box have height *Low*, but if the monkey climbs onto the box he will have height *High*, the same as the bananas. ...

A representation is what generates in your mind the mental representation you perceive, for instance, the text that you read above.

Representation and mental representation (example)

Example 2 The slides you're reading are an example of representation. However, what every student perceives(and learns) from the slides is part of his/her personal analogical mental representation

Representation (remarks)

- What we perceive (see, hear, touch, ...) are analogical mental representations (not representations!);
- Images, videos, music, sound, are analogical representations. They are not mental representations. They are "externalized" descriptions of our "internal" analogical mental representations;
- What we think is a linguistic mental representation (not a representation!);
- What we say or write are linguistic representations. They are not mental representations. They are "externalized" descriptions of our "internal" linguistic mental representations;

Representation (remarks)

- Analogical representations **depict**, but do not describe, what is the case in the world;
- Linguistic representations **describe**, but do not depict, what is the case in the world;
- Linguistic representations can be used to describe what is the case in the world, but only indirectly, by describing analogical representations;
- Analogical representations generate both analogical and linguistic mental representations;
- Linguistic representations generate both linguistic and analogical representations;
- Representations are the only means we have to communicate and reason about what is the case in the world;
- Both analogical and linguistic representations can be used to learn new representations.

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