

Chapter 2

Reference models

Exercise 2.1 (Linguistic and analogical mental representations) Create an analogical representation using set theory for this linguistic mental representation.

- In(tree, lab)
- In (monkey1, lab)
- In(monkey2, lab)
- Eating(monkey1, banana)
- SittingOn(monkey2, tree)*
- Scratching(monkey2, hisHead)*

Exercise 2.2 (Linguistic and analogical mental representations) Create an analogical representation using set theory for this linguistic mental representation. This time improve it using labels.

- In(tree, lab)
- In (monkey1, lab)
- In(monkey2, lab)
- Eating(monkey1, banana)
- SittingOn(monkey2, tree)*
- Scratching(monkey2, hisHead)*

Exercise 2.3 (Linguistic and analogical mental representations) Create an analogical representation using knowledge graphs for this linguistic mental representation.

- In(tree, lab)
- In (monkey1, lab)
- In(monkey2, lab)
- Eating(monkey1, banana)
- SittingOn(monkey2, tree)*
- Scratching(monkey2, hisHead)*

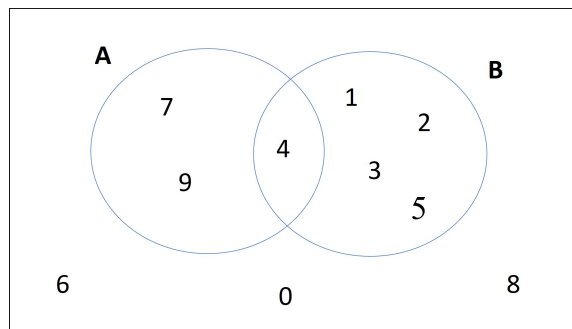
Exercise 2.4 (Linguistic and analogical mental representations) Create an analogical representation using knowledge graphs for this linguistic mental representation. This time improve it using labels.

- In(tree, lab)
- In(monkey1, lab)
- In(monkey2, lab)
- Eating(monkey1, banana)
- SittingOn(monkey2, tree)*
- Scratching(monkey2, hisHead)*

Exercise 2.5 (Set Theory) The sets A and B consist of numbers from 0 to 9, such that: $A = \{4, 7, 9\}$ and $B = \{1, 2, 3, 4, 5\}$. Illustrate these sets in a Venn diagram.

Exercise 2.6 (Set Theory) Given the Venn diagram below, say which of the following statements are true.

1. A is the empty set
2. $4 \in A$ and $4 \in B$
3. $A \subseteq B$
4. $0 \notin A$
5. The universal set U contains all the numbers from 0 to 9



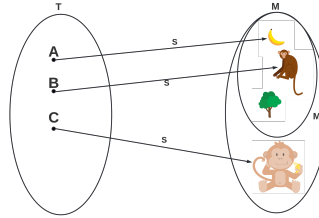
Exercise 2.7 (Set Theory) Provide 3 examples of relations between people that are (a) symmetric and transitive, and (b) anti-symmetric.

Exercise 2.8 (ER Creation) Create an ER Model from this theory:

- There is a tree
- There is a banana
- The monkey is eating a banana
- The monkey is sitting on a tree*
- The monkey is scratching his head*

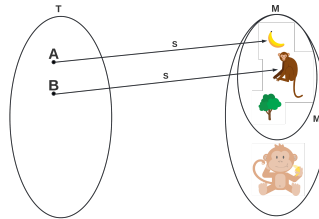
Exercise 2.9 (Complete and Correct?) Consider the sentences and the modeling of the theory. Say whether it is complete, correct, complete and correct, incomplete, or incorrect.

- A = "There is a banana"
- B = "There is a monkey"
- C = "There is a tree"
- D = "The monkey is eating a banana"



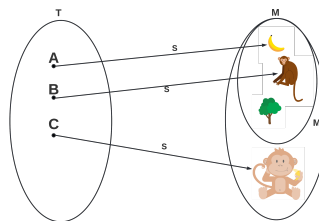
Exercise 2.10 (Complete and Correct?) Consider the sentences and the modeling of the theory. Say whether it is complete, correct, complete and correct, incomplete, or incorrect.

- A = "There is a banana"
- B = "There is a monkey"
- C = "There is a tree"
- D = "The monkey is eating a banana"



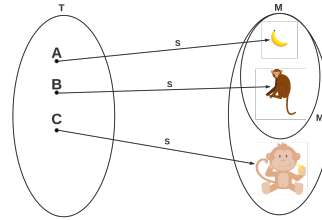
Exercise 2.11 (Complete and Correct?) Consider the sentences and the modeling of the theory. Say whether it is complete, correct, complete and correct, incomplete, or incorrect.

- A = "There is a banana"
- B = "There is a monkey"
- C = "The monkey is eating a banana"
- D = "There is a tree"



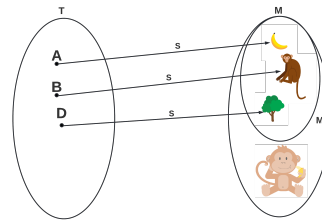
Exercise 2.12 (Complete and Correct?) Consider the sentences and the modeling of the theory. Say whether it is complete, correct, complete and correct, incomplete, or incorrect.

- A = "There is a banana"
- B = "There is a monkey"
- C = "There is a tree"
- D = "The monkey is eating a banana"



Exercise 2.13 (Complete and Correct?) Consider the sentences and the modeling of the theory. Say whether it is complete, correct, complete and correct, incomplete, or incorrect.

- A = "There is a banana"
- B = "There is a monkey"
- C = "There is a tree"
- D = "The monkey is eating a banana"



Exercise 2.14 (\mathcal{KG}) What is a knowledge graph from the point of view of the graph theory?

Exercise 2.15 (Design a Knowledge Graph) Represent with a knowledge graph the following model: "Fausto works for the University of Trento, that is located in Italy" and convert it into triples.

Exercise 2.16 (Design a Knowledge Graph) Represent with a knowledge graph the following linguistic model: "Fausto and Mario work for the University of Trento, that is located in Italy" and convert it into triples.

Exercise 2.17 (Design a Knowledge Graph) Represent with a knowledge graph the following linguistic model: "Mario is male and is born on 1969-09-26" and convert it into triples.

Exercise 2.18 (Design a Knowledge Graph) Represent the content of the following webpage as a knowledge graph:

Fausto Giunchiglia
Full professor
Department of Information Engineering and Computer Science

Via Sommarive, 5 - 38123 Povo
tel. 0461 281533
fausto.giunchiglia@unitn.it
https://www.dsi.unitn.it/~fausto/

Expertise: Access control Artificial Intelligence Automated reasoning Big data Data integration
Information & Communication Technology (ICT) Knowledge management Multi-agent systems
Natural language processing Personal life Pervasive computing Privacy Semantic interoperability
Semantic search Semantic web

Teaching Publications Dissertations and Theses Projects Office Hours

19 results

This section provides the list of research projects funded by external organizations, or by UniTrento, on a competitive basis, for which the person is the main scientific responsible person. Data source: UniTrento Projects Register

Title	Start date [1]	End date
Joint Industrial Data Exchange Pipeline	01/06/2022	31/05/2025
DELPHI - Discovering Life Patterns	29/08/2019	28/08/2023

UNITRENTO
DIGITAL UNIVERSITY

HOME PEOPLE EVENTS AND CONFERENCES STUDY BODY GOVERNANCE ORGANIZATIONAL UNIT

Department of Cellular, Computational and Integrative Biology - CIBIO
academic department
Director: Paolo Marchi
Via Sommarive, 9, Povo, 38123 TN
http://www.cibio.unitn.it

Department of Civil, Environmental and Mechanical Engineering
academic department
Director: Oreste S. Bursi
Via Mesiano, 77, 38123 Trento
http://www.dicem.unitn.it

Department of Economics and Management
academic department
Director: Flavio Bazzana
Via Vigilio Ilama, 5, Trento, 38122 TN
http://www.economia.unitn.it

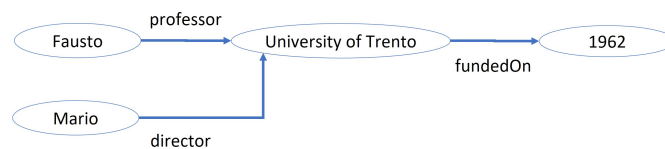
Department of Humanities
academic department
Director: Marco Giezzi
Via Tomaseo Gar, 14, Trento, TN
http://www.lettere.unitn.it

Department of Industrial Engineering
academic department
Director: Alessandro Pegoretti
Via Sommarive, 9, Povo, 38123 TN
http://www.dii.unitn.it

Department of Information Engineering and Computer Science
academic department
Director: Paolo Giurini
Via Sommarive, 9, Povo, 38123 TN
https://www.dsi.unitn.it

Exercise 2.19 (Knowledge Graph Reasoning) Given the knowledge graph below and their corresponding representation in natural language say if they are mutually consistent and motivate your answer.

- The University of Trento was funded on 1962. Fausto is a professor of the University of Trento. Mario is a director of the University of Trento.
- The University of Trento was funded on 1962. Fausto and Mario work for the University of Trento.
- The University of Trento was funded on 1962. Fausto is a professor of the University of Trento.



Exercise 2.20 (Set/Graph Theory) Answer to the following questions:

- What makes a modelling language formal?
- What is the difference between a directed graph and an undirected graph?
- Is a knowledge graph the result of a modelling activity?
- What exactly do you represent with knowledge graphs?

- What are the advantages of a knowledge graph w.r.t. other representations?
- In the context of knowledge graphs, what is the difference between an entity type and a data type?
- In the context of knowledge graphs, what is the difference between object properties and data properties?

Exercise 2.21 (Knowledge Graph Representation) Represent with a knowledge graph the following model: “University of Trento (officially “Università degli Studi di Trento”) was founded on 1962. Its institutional address is via Calepina, 14 - 38122 Trento. Its web site is <https://www.unitn.it/>. It is research partner of Fondazione Edmund Mach” and convert it into triples.

Exercise 2.22 (Knowledge Graph Representation) Represent with a knowledge graph the following linguistic model: “Alice and Bob both own a Fiat Panda. Alice bought a new one in 2023, while Bob’s was a second hand vehicle from 2013 that he bought in 2018.” and convert it into triples.

Exercise 2.23 (Knowledge Graph Representation) Design a comprehensive knowledge graph from the following models:

- M1: cure A worked with patient 1 affected by disease X; patient 1 is male
- M2: cure A worked with patient 2 affected by disease X; patient 2 is male
- M3: cure A did not work with patient 3 affected by disease X; patient 3 is female.

Exercise 2.24 (Knowledge Graph Representation) Design a comprehensive knowledge graph from the following picture.

