Semantic Web and Linked Data

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Semantic Web and Linked Data

The syllabus of Semantic Web and Linked Data has a strong emphasis on **representation and querying languages** and their underlying principles, namely logic and inference.

These languages and principles provide a body of knowledge that ranges from the concepts of Semantic Web and Linked Data to their application in describing web resources and in explicit and interoperable representations for data in multiple domains.

Semantic Web and Linked Data

- Given the growing interest and evolution on Large Language Models and Generative AI, this year practical work topics will allow to explore **Neuro Symbolic AI** approaches and the potential of integrating Ontologies with Large Language Models.

Objectives

1. Describe and define the concepts and technologies associated with the Semantic Web;

2. Analyze and prepare artifacts (e.g., ontologies) for use in Semantic Web solutions;

3. Evaluate the value and applicability of semantic web strategies in various contexts;

4. Identify and apply multiple Semantic Web-related tools and techniques;

5. Analyze the characteristics of data and documents accessible to people and machines;

6. Relate web resources to the metadata that describe and link them;

7. Treat ontologies as providers of description tools;

8. Analyze existing ontologies and create new ontologies;

9. Explore applications that manipulate semantic web information descriptions and develop systematic methods for creating metadata;

10. Experiment with applications that explore Linked Open Data on the Web;

11. Use tools and languages to explore Semantic Web content;

12. Compare semantic web-based services and other approaches to resource description.

Bibliography

- Several provided during the course;
- Antoniou, G., Groth, P., van Harmelen, F., & Hoekstra, R. (2012). A Semantic Web Primer. MIT Press; 3rd edition.
- Heath, T., Bizer, C. (2011). Linked Data: Evolving the Web into a Global Data Space (1st edition). Synthesis Lectures on the Semantic Web: Theory and Technology, 1:1, 1-136. Morgan & Claypool.
- International Semantic Web Conference (ISWC), http://iswc.semanticweb.org/
- Journal of Web Semantics, Elsevier, http://www.elsevier.com/wps/find/journaldescription.cws_home/671322/description

Teaching Methodology

- The theoretical components of classes are used for topic presentation, with reference to the bibliography, and for running small assignments to stimulate learning.

- The time dedicated to practical work is used to discuss topics proposed to students, to answer practical exercises on the Semantic Web and to develop the practical work.

- The students will apply the theoretical concepts in a small project in an area of interest.

- Evaluation: distributed assessment with final exam

  - Final Rating = 60% x GradeWork + 40% x GradeExam

The Semantic Web

"The **Semantic Web** is an extension of the current web in which information is given well-defined **meaning,** better enabling computers and people to **work in co-operation**."

[Berners-Lee *et al*, 2001]

Further reading

- A Survey of the First 20 Years of Research on Semantic Web and Linked Data

- Semantic Web Activity, W3C

- Data Activity, W3C

- Semantic Web Road Map, An attempt to give a high-level plan of the architecture of the Semantic WWW, Tim Berners-Lee, 1998