II.3521 – Semantic Web and Knowledge Management

General information

Semantic Web and Knowledge Management
Module ID: II.3521
Module leader: Ammar KHEIRBEK
ECTS: 5 credits
Average amount of work per student: from 100 to 150 hours, 42 of which are supervised
Teamwork: yes
Keywords: Semantic Web, XML, Ontologies, Inference, RDF(S), SPARQL, OWL

Presentation

Rarely has the history of science experienced an adventure such as that of ICT, and more particularly that of the evolution of the Web (WWW) towards the Social Web (Web 2.0), the Semantic Web (Web 3.0), linked data, the Internet of Things (IoT).

In this module, we will briefly "tell" this story and then devote most of the module's time to the Semantic Web and the technologies that revolve around it. And to better understand the future of this evolving field, we will do an in-depth study of knowledge: how it is represented, managed and inferred.

We will explain the direct relationship between the evolution of knowledge "engineering" and the evolution of Semantic Web technologies.

Educational objectives

- Working with an ontology
- Query and select semantic data very precisely across the Web
- Represent and publish linked data on the web
- Represent vocabulary, reason and derive new data

Prerequisite

Basic notions of databases, programming, logic, information system. A solid mathematical background is also required.

Content/Program

Concepts

- Evolution of Hypertext: From Primitive Versions to the Web (WWW) and the Social Web
- The Evolution of Conceptual Hypermedia: From Basic Ideas to the Semantic Web
- Knowledge
- Knowledge representation
- Knowledge Management
- Knowledge Engineering
- Ontologies
- Getting Started with an Ontology: Protected
- Basic concepts of the Semantic Web: URI, RDF, RDFs, SPARQL...
- Linked data
- Advanced topics

Tools used

- XML, DTD, XML Schema, XPath and XQuery technologies with database management systems such as eXist and xBase
- Jena RDF, Jena ARQ, OWL API, Jena Reasoner APIs
- Protégé

Pedagogical methods

Learning methods

The module alternates between theory (about 60%) and practice (about 40%). Each class session will be followed by a practical session to apply the knowledge learned from the previous course. An implementation or bibliographic research project will start in the middle of the module. The project will be carried out in a trio.

Schedule: 14 sessions of 3 hours, the practical work is based on a problem-based approach.

Evaluation methods

The evaluations are all individual.

- TP: 20%
- Quiz: 10%
- Project (2 to 3 students per project): 30%
- Final exam: 40%

Language of work

Module delivered entirely in English. The students' production can be in French or English.

Bibliography, Webography, Other sources

- Abiteboul, S., Manolescu, I., Rigaux, P., Rousset, M. C., & Senellart, P. (2011). Web Data Management. Cambridge University Press.
- Antoniou, G., & Van Harmelen, F. (2012). A Semantic Web Primer. MIT press.
- The World Wide Web Consortium (W3C). W3C Standards. Retrieved November 09, 2017, from https://www.w3.org/standards/
- Berners-Lee, T., Hendler, J., & Lassila, O. (2001). The Semantic Web. Scientific American, 284(5), 28-37.
- Shadbolt, N., Berners-Lee, T., & Hall, W. (2006). The Semantic Web Revisited. IEEE intelligent systems, 21(3), 96-101.
- Several online resources.