Knowledge graphs, description logics, reasoning on data

ECTS : 3

Volume horaire : 24

Description du contenu de l'enseignement :

Introduction to Knowledge Graphs, Description Logics and Reasoning on Data.

Knowledge graphs are a flexible tool to represent knowledge about the real world. After presenting some of the existing knowledge graphs (such as DBPedia, Wikidata or Yago) , we focus on their interaction with semantics, which is formalized through the use of so-called ontologies. We then present some central logical formalism used to express ontologies, such as Description Logics and Existential Rules. A large part of the course will be devoted to study the associated reasoning tasks, with a particular focus on querying a knowledge graph through an ontology. Both theoretical aspects (such as the tradeoff between the expressivity of the ontology language versus the complexity of the reasoning tasks) and practical ones (efficient algorithms) will be considered.

Program:
1. Knowledge Graphs (history and uses)
2. Ontology Languages (Description Logics, Existential Rules)
3. Reasoning Tasks (Consistency, classification, Ontological Query Answering)
4. Ontological Query Answering (Forward and backward chaining, Decidability and complexity, Algorithms, Advanced Topics)

References:
-- The description logic handbook: theory, implementation, and applications. Baader et al., Cambridge University Press
-- Foundations of Semantic Web Technologies, Hitzler et al., Chapman&Hall/CRC
-- Web Data Management, Abiteboul et al., Cambridge University Press

Prerequisites:
-- first-order logic;
-- complexity (Turing machines, classical complexity classes) is a plus.