Knowledge Representation & Reasoning: Foundations and Applications

SIKS course

November 26-27, 2015

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*Thursday, November 26*

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10.00 - 12.00   Modal logic for knowledge representation

prof. dr. J-J. Ch. Meyer (UU)

Modal logic offers a very general way of representing knowledge of many different kinds and reasoning about it: e.g. action, time, knowledge, belief, obligation, and prohibition. Modal logic is therefore widely employed as a logic for AI, and knowledge

representation in particular.

12.00 - 13.00  *lunch*

13.00 – 15.00 Semantics on the Web

dr. R. Hoekstra (VU)

This lecture discusses the requirements for shared meaning on the Web and introduces the syntactic and semantic foundations of a family of Web-based knowledge representation languages known as Semantic Web Technology.   
After this lecture, you will have basic knowledge of URIs, RDF, RDFS, OWL, inferencing and SPARQL. The lecture includes a hands-on session in which   
you build a model (an 'ontology') on top of some existing data, and explore it   
for inferred new knowledge.

15.00 – 15.15 *break*

15.15 – 17.15 Linked Open Data.

Dr. A. Khalili (VU)

Within the course, we will present Linked Data as a set of best practices for publishing and connecting structured data on the Web. These best practices have been adopted by an increasing number of data providers over the past years, leading to the creation of a global data space that contains many billions of assertions – the Web of Linked Data. The presentation will cover the following topics:

* Linked (Open) Data Principles
* Linked Data Lifecycle
* An overview on Linked Data Cloud
* DBpedia and its applications

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*Friday, November 27*

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 09.30 - 11.30  Qualitative Modelling and Reasoning

    dr. B. Bredeweg (UvA)

Humans continuously reason about the systems that surround them. This kind of reasoning is sometimes referred to as common-sense reasoning, partly because it is often intuitive and because humans do not use any numerical information to do so. Similarly, experts (physicists, engineers, biologists, etc.) use conceptual knowledge when explaining or arguing about system behaviour, even when data is abundant. A key challenge is to understand this kind of reasoning and to create means for automating it using computers.

Qualitative Reasoning is at the heart of this research. It is an innovative approach within Artificial Intelligence that involves non-numerical descriptions of systems and their behaviour, preserving all the important behavioural properties and distinctions. It has been applied successfully to problems in the automotive industry, to aeronautics and spacecraft, thermodynamics, and ecology. In addition to real-world applications the research focusses on cognition and education; explaining human reasoning and developing means to support and enable this ability.

11.30 - 11.45  *break*

11.45 - 12.30   Reasoning with Uncertainty (1)  
dr. A.J. Hommersom (RU)

12.30 - 14.00   *lunch*

14.00 – 14.45 Reasoning with Uncertainty (2)  
dr. A.J. Hommersom (RU)

14.45 - 15.00  *break*

15.00 – 17.00 Introduction to Causal Reasoning

dr. J.M. Mooij (UvA)

In this tutorial, I will explain the basics of causal reasoning using the framework of Judea Pearl. This framework uses Structural Equation Models for expressing and modeling causal relationships, both qualitatively an quantitatively. It also formalizes the semantics of hypothetical interventions and counterfactual reasoning. The relationship with Bayesian networks will be discussed, as well as Pearl's do-calculus for causal reasoning and the back-door criterion for covariate adjustment.