

AI 814: Knowledge Representation and Reasoning

Many modern systems where NLP is used for exploring patterns in the data, or in the cases where multimedia including text is considered, it becomes important to see relationships between different objects and patterns. Thus, ontologies need to be built for reasoning and knowledge representation becomes the key to it. Only Utrecht offers nothing akin to it. The rest all include it in one form or the other.

Recommended Books:

1. Knowledge Representation and Reasoning, 3rd edition, Gerardus Blokdyk, Emereo Pty Limited, 2018.
2. Knowledge Representation and Reasoning with Deep Neural Networks, Arvind Ramanathan Neelakantan, University of Massachusetts Libraries, 2017.
3. Knowledge Representation and Reasoning, Ronald Brachman, Hector Levesque, Elsevier, 2004.

Credit Hours: 3 (3, 0)

Course Objectives:

- To understand what representation is for knowledge.
- To use logic (both propositional and first order) for representation.
- To understand how reasoning can be done in logic, and what entailment is.
- To understand the theory and principles of automated theorem proving.
- To get acquainted to tools that can be used for knowledge representation and reasoning.

Topics / Contents	Allocated Periods
Topics include propositional logic, its syntax and semantics. Proof by resolution and automated theorem proving. First-order logic, its syntax	
and semantics. Forward and backward chaining. Semantic nets. Inheritance in taxonomies. Other topics include other approaches and issues (e.g. predicate logic, fuzzy logic, weak and strong slot and filler structures), knowledge acquisition, the frame problem, symbolic reasoning under uncertainty (nonmonotonic reasoning, augmenting a problem Solver), statistical reasoning (e.g. probability and Bayes Theorem, Bayesian networks, Dumpster-Shafer theory), building knowledge-based systems.	45