Knowledge Representation — Learning Objectives and Exam Content

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Knowledge Representation and Preliminaries

- Symbolic AI vs. data-driven AI
- Five aspects of knowledge representations
- Decision problems and decision procedures

Description Logics

- Syntax and Semantics of $\mathcal{ALC}$ (concepts, axioms, ontologies)
- What are the central reasoning tasks
- The $\mathcal{EL}$ precompletion algorithm for computing subsumers
- The $\mathcal{ALC}$ tableau procedure for deciding satisfiability
- Additional concept and axiom types in $\mathcal{SROIQ}(D)$ (minus concrete domains and minus additional restrictions for decidability)
- How the logics looked at relate to each other regarding expressivity and (theoretical) difficulty in reasoning

Argumentation

- Default theory
- Extensions of default theory
- The process tree
- Abstract argumentation frameworks (AFs)
- Extension-based semantics of AFs
- Labeling-based semantics of AFs
- Decision problems of AFs: $\mathit{Exists}_\sigma(F)$, $\mathit{Cred}_\sigma(a, F)$, $\mathit{Skept}_\sigma(a)$, $\mathit{Ver}_\sigma(S, F)$
- Preferred discussion games for AFs

Bayesian Networks

- Basics of probability theory and graph theory
- Independencies through DAGs
- Factors and operations on factors
- Marginalization through variable elimination
- Interaction graphs and elimination order heuristics
- Computation of joint, prior marginal, posterior marginal MAP, and MPE probabilities