

Principles of Knowledge Representation and Reasoning

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Exercise Sheet 9

Due: June 28th, 2015

Exercise 9.1 (PROPERTIES OF DEFAULT LOGIC, 2 + 2 + 2)

Proof or disproof:

- (a) Let $\langle D, W \rangle$ be a propositional default theory and let D' be a set of normal defaults with $D \subseteq D'$. If E is an extension of $\langle D, W \rangle$, then there exists an extension E' of $\langle D', W \rangle$ such that $E \subseteq E'$.
- (b) Let $\langle D, W \rangle$ be a propositional default theory and ϕ be a formula that skeptically follows from $\langle D, W \rangle$. Then, each formula that skeptically follows from $\langle D, W \cup \{\phi\} \rangle$ also skeptically follows from $\langle D, W \rangle$, and vice versa.
- (c) Let $\langle D, W \rangle$ be a propositional, semi-normal default theory that has a consistent extension E such that the justification (consistency condition) of each default rule in D is consistent with E (and thus with W). Then W must be consistent with the set of all justifications of the default rules in D .

Exercise 9.2 (KNOWLEDGE REPRESENTATION AND REASONING IN DEFAULT LOGIC, 2 + 2)

Translate into first-order default logic and check whether the given conclusions follow credulously and/or skeptically.

- (a) *Typically, computer science students like computers. Female students who like computers are typically interested in cognitive science. Computer science students are typically female, as for example Anne; but Bob is an exception to this rule. Conclusions: Anne is interested in cognitive science. Bob is not interested in cognitive science.*
- (b) *By default, students are not lazy. But computer science students are typically intelligent, and intelligent students are usually lazy. Jim and Mary study the humanities, Anne and Bob study computer science. Conclusions: Anne and Bob are lazy; Mary and Jim are not.*

Exercise 9.3 (ANSWER SETS, 2)

Find an answer set for the program Π_n consisting of the following n rules

$$p_i \leftarrow \text{not } p_{i+1}. \quad (1 \leq i < n)$$

where n is a natural number.