TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Computer Science Institute of Theoretical Computer Science, Chair of Automata Theory

Fuzzy Description Logics

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Exercise Sheet 4

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Exercise 4.1 Prove or disprove. For any t-norm $\otimes$ the following equivalences hold:

- $\neg(C \sqcup D) \equiv \neg C \sqcap \neg D$
- $\neg(C \sqcap D) \equiv \neg C \sqcup \neg D$

Exercise 4.2 Let A be a concept name. Construct a Lukasiewicz-$\mathcal{ALC}$ ontology such that $A^{\mathcal{I}}(x) \in \{0.25, 0.75\}$ for every model $\mathcal{I}$ and $x \in \Delta^{\mathcal{I}}$.

Exercise 4.3 For which of the three standard t-norms $\otimes$ are the following $\otimes$-$\mathcal{ALC}$ ABoxes consistent?

- $\mathcal{A}_1 = \{\langle A(a), 0.5\rangle, \langle \neg(A \sqcap A), 1\rangle\}$
- $\mathcal{A}_2 = \{\langle \forall r.A(a), 1\rangle, \langle \exists r.\neg A(a), 0.1\rangle$

Exercise 4.4 Prove the missing cases of Lemma 3.4 from the lecture: For all complex concepts C and $x \in \Delta^{\mathcal{I}}$, $C^{\mathcal{J}}(x) = \mathbb{1}\left(C^{\mathcal{I}}(x)\right)$.

Exercise 4.5 Does Lemma 3.5 from the lecture hold for assertions of the form $\langle C(a) \leq q\rangle$? Explain why.