



## Description Logics

### Exercise Sheet 9

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#### Exercise 34

Reconsider the claim: for all  $D \in S_{C,T}$ , we have  $D \in R(u) \implies u \in D^{\mathcal{I}_R}$ . Show the claim by induction on the structure of  $D$  for the missing cases:

- $D = D_1 \sqcup D_2$  and
- $D = \forall r.E$ .

#### Exercise 35

Recall the following: A *propositional Horn clause* is of the form  $p_1, \dots, p_k \rightarrow p$  where  $p_1, \dots, p_k$  are propositional variables and  $p$  is a propositional variable or  $\perp$ . A *propositional Horn formula* is a finite set of propositional Horn clauses. The satisfiability problem of propositional Horn formulas can be decided in linear time.

Show that the emptiness problem for looping tree automata can be decided in linear time by giving a linear-time reduction to the satisfiability problem of propositional Horn formulas.

#### Exercise 36

Show that the transformation of  $\mathcal{FL}_0$ -concepts into normal form requires only polynomial time.

#### Exercise 37

Show that subsumption in  $\mathcal{FL}_0$  w.r.t. acyclic TBoxes is in co-NP by giving a polynomial-time reduction from this problem to the inclusion problem for acyclic finite automata (which is in co-NP).