



## Description Logics

### Exercise Sheet 9

Dr. rer. nat. Rafael Peñaloza / Marcel Lippmann  
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#### Exercise 38

Let  $\mathcal{T}$  be a general  $\mathcal{EL}$ -TBox and  $\hat{\mathcal{T}}$  the TBox obtained from exhaustive application of the normalisation rules NF1–NF5 to  $\mathcal{T}$ .

Finish the proof of Lemma 5.18 by showing the following:

- $\hat{\mathcal{T}}$  can be obtained from  $\mathcal{T}$  in polynomial time.
- $\hat{\mathcal{T}}$  is in normal form.
- For all concept names  $A, B$  occurring in  $\mathcal{T}$ , we have  $A \sqsubseteq_{\mathcal{T}} B$  iff  $A \sqsubseteq_{\hat{\mathcal{T}}} B$ .

#### Exercise 39

Consider the TBox  $\mathcal{T}$  consisting of the following axioms:

$$\begin{aligned} A &\sqsubseteq B \sqcap \exists r.C \\ B \sqcap \exists r.B &\sqsubseteq C \sqcap D \\ C &\sqsubseteq \exists r.A \sqcap B \\ \exists r.\exists r.B \sqcap D &\sqsubseteq \exists r.(A \sqcap B) \end{aligned}$$

Check whether the following subsumption relations follow:

- $A \sqsubseteq B$
- $A \sqsubseteq \exists r.\exists r.A$
- $B \sqcap \exists r.A \sqsubseteq \exists r.C$