



Logic-Based Ontology Engineering

Summer Semester 2018

Exercise Sheet 6

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Exercise 6.1 We consider the ontology on musical instruments again. Use the OWLax plugin to augment

- (a) the properties *hasPart* and *hasComponent* with domain and range restrictions.
- (b) the concept *BowOfViolin* by the fact the the bow is made of wood and horse hair (by use of the *hasPart* or the *hasComponent* property).

Exercise 6.2 We consider the following ontology:

$$\begin{aligned} \mathcal{T} = \{ & \textit{Female} \sqsubseteq \textit{Person}, & \mathcal{R} = \{ & \textit{dom}(\textit{hasChild} \textit{ Person}), \\ & \textit{Male} \sqsubseteq \textit{Person}, & & \textit{ran}(\textit{hasChild} \textit{ Person}) \} \\ & \textit{Father} \sqsubseteq \textit{Male}, \\ & \textit{Male} \sqsubseteq \neg \textit{Female} \} \end{aligned}$$

$$\begin{aligned} \mathcal{A} = \{ & \textit{Female}(\textit{anna}), \textit{hasChild}(\textit{anna}, \textit{heinz}), \\ & \textit{Male}(\textit{heinz}), \\ & \textit{Male}(\textit{markus}), \textit{Father}(\textit{markus}), \textit{hasChild}(\textit{markus}, \textit{anna}), \\ & \textit{Male}(\textit{martin}), \textit{Father}(\textit{martin}), \textit{hasChild}(\textit{martin}, \textit{heinz}), \\ & \textit{Female}(\textit{michelle}), \\ & \textit{Father}(\textit{stefan}), \textit{Male}(\textit{stefan}), \textit{hasChild}(\textit{stefan}, \textit{markus}) \} \end{aligned}$$

and want to learn a definition for the concept name *Father*.

- (a) Starting from \top , use the refinement operator ρ_c with the ontology $\mathcal{O} = (\mathcal{A}, \mathcal{T}, \mathcal{R})$ to generate all candidate concepts of maximal size 4.
- (b) What are the accuracy and the score for each concept from (a)?

“DL-Learner” is a tool for concept learning. Download the Protégé plugin for DL-Learner and install it (since it is incompatible with the VOWL plugin, you may have to remove VOWL from Protégé’s plugin folder first).

- (c) Load the ontology `father_oe.owl` (from the lecture’s web page) in Protégé.
- (d) Navigate to the concept *Father* in Protégé, and add a new equivalence axiom for it. In the dialog window, find the “DL-Learner” tab, and let it suggest definitions for *Father*.
- (e) Speculate why the accuracy values from (d) are different to the results of (b).

Exercise 6.3 We consider distance measures on concept names.

- (a) Use the Levenshtein distance to compute a distance measure δ_1 between the sets of labels $\{Product, Provider, Creator\}$ and $\{Book, Translator, Publisher, Writer\}$.
- (b) Consider the following distance measure δ_2 , which is based on WordNet:

	<i>Book</i>	<i>Translator</i>	<i>Publisher</i>	<i>Writer</i>
<i>Product</i>	.82	.88	.88	.85
<i>Provider</i>	.83	.89	.76	.71
<i>Creator</i>	.82	.53	.88	.85

Aggregate the two distance measures δ_1 and δ_2 using

- (i) the minimum function.
- (ii) the weighted sum with $w_1 = w_2 = \frac{1}{2}$.

Exercise 6.4 Convert the results obtained in Exercise 6.3 into similarity measures, and use these to compute alignments.

- (a) Find a threshold τ for which the hard threshold and proportional threshold methods produce different alignments (and each yields at least two correspondences).
Find a threshold for which they produce the same alignment.
- (b) Find an alignment that satisfies the stable marriage criterion.