

From Reasoning Problems to Non-standard Reasoning Problems and One Step Further

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Abstract. In this talk, I will concentrate on non-standard reasoning problems in DLs, and mainly on even less standard problems: non-standard reasoning problems ask for the computation of some minimal subset, maximally specific concept, etc. with certain properties. In contrast, subjective problems involve other parameters and thus come with additional design choices. I will focus on the problem of “Learning Ontologies from Data” but will mention other problems like “How similar are these concepts” on the way. “Learning Ontologies from Data” could also be called “Finding axioms that describe interesting correlations in our data” or “Semantic Data Analysis” and is an interesting and challenging topic. I will report on our experience with *DL Miner*, a framework and tool Slava Sazonau and I developed, which is able to learn general DL axioms from a DL knowledge base, i.e., given certain parameters, it generates all potentially interesting axioms/hypotheses and evaluates each across a range of (independent) quality measures. For an axiom to be “potentially interesting”, it has to be somehow reflected in/supported by the ABox and TBox, but not yet covered in/entailed by the TBox. As it turns out, an axiom can be “interesting” for each of 3 reasons: (1) it can indicate known domain knowledge (so it should be added if we are after a comprehensive TBox); (2) it can indicate possibly new domain knowledge and thus provide new insights into the domain in the classical Machine Learning sense; (3) it can reveal biased data and modelling errors, so support data cleaning. I will describe the computational and conceptual challenges and solutions, evaluation strategies, the insights gained, and the ways in which this framework can be applied.