Foundations of Semantic Web Technologies

Tutorial 2

Lukas Schweizer

SS 2017

Exercise 2.1. Recap the notions "theory", "logical consequence" and "equivalence" and decide if the following claims are true or false for FOL. Give an informal justification for your answer.
For arbitrary theories $\mathcal{T}$ and $\mathcal{S}$ holds:

(a) If a formula (axiom) F is generally valid, then $\mathcal{T} \models F$, i.e., every theory has at least all tautologies as consequence.

(b) The more axioms a theory contains the more models it has. More precisely: if $\mathcal{T} \subseteq \mathcal{S}$, then every model of $\mathcal{T}$ is a model of $\mathcal{S}$.

(c) The more axioms a theory contains, the more logical consequences it has. More precisely, if $\mathcal{T} \subseteq \mathcal{S}$, then every logical consequence from $\mathcal{T}$ is also a consequence from $\mathcal{S}$.

(d) If $\neg F \in \mathcal{T}$, then $\mathcal{T} \models F$ can never hold(F being an arbitrary formula).

(e) If two theories differ syntactically ($\mathcal{T} \neq \mathcal{S}$), then they differ in at least one logical consequence (e.g., through the existence of a formula F with $\mathcal{T} \models F$ but $\mathcal{S} \not\models F$).

Exercise 2.2. Decide if the following propositions are true or false:

(a) Blank nodes can stand for arbitrary resources.

(b) URIs can stand for arbitrary resources.

(c) Every blank node has an ID.

(d) Two blank nodes with different IDs can stand for the same resource.

(e) Two different URIs can stand for the same resource.

(f) Blank nodes carrying the same ID that occur in several RDF documents must stand for the same resource.

(g) URIs that occur in several RDF documents must stand for the same resource.

(h) Two different Literals can never stand for the same value.

(i) Two Literals with different datatype can never stand for the same value.

(j) A URI can never stand for a datatype value.

(k) Blank nodes cannot occur in the predicate position of triples.

(l) Blank nodes cannot stand for properties (that is, resources that belong to the class `rdf:Property`).

Exercise 2.3. Represent the following sentences graphically by means of reified triples (for space reasons, you may use usual prefixes instead of full URIs):

- Romeo thought that Juliet was dead.

- John believes that Mary wants to marry him.

- The dwarf noticed that somebody had been eating from his plate.

Exercise 2.4. Decide whether the following propositions can be satisfactorily modeled in RDFS and, if so, give the corresponding RDF(S) specification.

- Every pizza is a meal.

- Pizzas always have at least two toppings.

- Every pizza from the class `PizzaMargarita` has a `Tomato` topping.

- Everything having a topping is a pizza.

- No pizza from the class `PizzaMargarita` has a topping from the class `Meat`.

- "Having a topping" is a containedness relation.

Exercise 2.5. As you know, the unique name assumption does not hold in RDF(S), i.e. in a model, several URIs might be assigned to the same resource. Contemplate whether (and if so, how) it is possible to specify in RDFS that two given URIs refer to the same resource.