

M2R Exam – Semantic web: from XML to OWL

Semantic web part

Duration : 2h30

Documents allowed – no communication device allowed

January 2015

Note: Read all the questions carefully before answering.

Social network part

Recommendations

Consider the following two expressions:

$$\begin{aligned} predictedRating(u, i) &= \sum_{i' \in I} ItemSim(i, i') \times rating(u, i') \\ predictedRating(u, i) &= \sum_{u' \in U} UserSim(u, u') \times rating(u', i) \end{aligned}$$

1. What does each expression represent in recommendations?
2. Describe an example $ItemSim(i, i')$ function discussed in class.
3. Describe an example of $UserSim(u, u')$ in Delicious.

Social Data Processing

1. What are inverted lists in Information Retrieval and how are they adapted to tag-based search on Delicious?
2. What is the property of a scoring function that enables early pruning?
3. How is the performance of a top-k processing algorithm measured?

Social Data Exploration

Consider the following social data exploration formulation: Given a set R of user ratings, find a set S of user groups s.t.:

$$\begin{aligned} |S| &\leq k \\ coverage(S, R) &\geq \alpha \\ error(S, R) &is\ minimized \end{aligned}$$

1. Provide two examples of error computation expressions and discuss their differences.
2. Describe in a few lines how a greedy algorithm can find k groups.

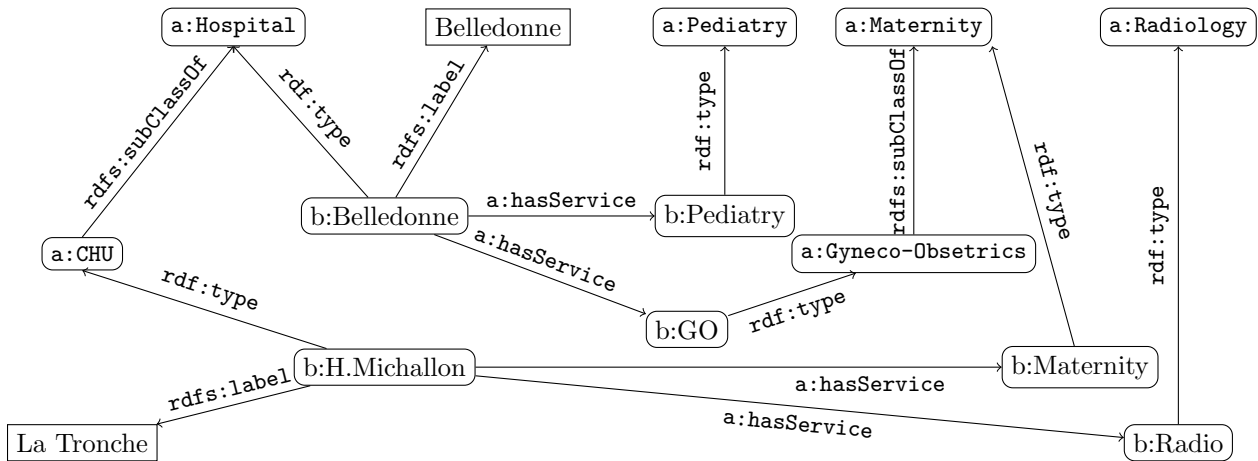


Figure 1: RDF graph G .

Semantic web part

RDF Entailment

Consider the graph G of Figure 1.

1. Explain what it means (in English or French, taking into account the meaning of RDFS vocabulary).
2. Rewrite it as a set of triples.

Given the GRDF graph $P = \{ ?x \text{ rdf:type } a:CHU . ?x \text{ a:hasService } ?y . ?y \text{ rdf:type } a:Maternity . \}$

3. Does $G \models_{RDF} P$? (explain how and/or why)

RDFS Entailment

Given $P' = \{ ?x \text{ rdf:type } a:Hospital . ?x \text{ a:hasService } ?y . ?y \text{ rdf:type } a:Maternity . ?x \text{ a:hasService } ?z . ?z \text{ rdf:type } a:Pediatry . \}$,

4. Does $G \models_{RDF} P'$? (explain how and/or why)
5. Which procedure may be used to derive that $G \models_{RDFS} P'$?

SPARQL CONSTRUCT

It is possible to generate RDF graphs from an RDF graph through the use of SPARQL CONSTRUCT. Consider the query Q :

```

CONSTRUCT { ?y rdf:type ?x }
WHERE { ?u rdfs:subClassOf ?x . ?y rdf:type ?u }.
  
```

6. Apply Q to the graph G of Figure 1 and give the resulting graph. Let us call the result $Q(G)$, does $G \cup Q(G) \models_{RDF} P'$?

7. For any map σ , does

$$\sigma(?u) \text{ rdfs:subClassOf } \sigma(?x). \sigma(?y) \text{ rdf:type } \sigma(?u) \models_{RDFS} \sigma(?y) \text{ rdf:type } \sigma(?x)$$

(explain why)

8. Is this related with the rules of the Herbrand closure? (tell if it corresponds more closely to one of these rules).

9. Would it be possible to transform all closure rules as SPARQL CONSTRUCTS? Do it or explain why.

10. What more is needed for computing the closure?