Linguaggi Logiche e
Tecnologie per la
Gestione Semantica dei
testi
RDFS

Introduction by example
RDFS

- W3C standard for an ontology language

- RDFS introduces resources (URIs) with a predefined meaning

- Inference engines that support RDFS allow to take that meaning into account

- RDFS inferences extend the RDF graph by means of inference and hence, affect query answering

- RDFS is very simple compared to SWRL or OWL, however, it is very useful in many context, allowing for increased productivity, easy data integration and interesting AI applications
Building blocks

- New namespace rdfs: 
  <http://www.w3.org/2000/01/rdf-schema#>

- New categories:
  - **Classes**, resources that share something in common, allow us to group things together. For example, Employee, Company. Resources that identify classes have rdf:type rdfs:Class
  - **Instances**, resources that are “members” of a class

Commonly, Class names are nouns
Building blocks

Resources can belong to multiple classes
Properties: Resources used as a predicate in statements

Commonly, Property names are multiple words, expressing direction and in camel-casing.
RDFS Ontologies

- RDFS Axioms
  - Are RDF triples!

- RDFS ontology is an RDF graph!

- An RDF graph may have a subgraph expressed in RDFS
  - We call the RDFS axioms/triples the Tbox of the ontology (terminological information, predefined meaning)
  - The rest is the Abox of the ontology (plain data, no predefined meaning)
Type propagation

- RDFS vocabulary: rdfs:subClassOf

- Key notions
  - sub class (on the left)
  - super class (on the right)

- Intuitive meaning, if \( \text{emp}=1 \) is an instance of sub class it is also an instance of super class

- Formal meaning: subsets

- Inference: type propagation

Similar to inheritance in Object Oriented formalisms
Type propagation

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  - `rdfs:subClassOf`

- **Key notions**
  - `sub class` (on the left)
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- **Formal meaning:** `subsets`

- **Inference:** `type propagation`

Similar to inheritance in Object Oriented formalisms.
Relation propagation

- **RDFS vocabulary:**
  rdfs:subPropertyOf

- **Key notions**
  - **sub property** (on the left)
  - **super property** (on the right)

- Intuitive meaning, if \((x,y)\) are connected with superproperty, they are also connected with subproperty.

- Formal meaning: **subsets** (of binary tuples)

- Inference: **relationship propagation**
Relation propagation

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- Key notions
  - sub property (on the left)
  - super property (on the right)

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- Formal meaning: subsets (of binary tuples)

- Inference: relationship propagation
Types by usage

- **RDFS vocabulary:**
  - rdfs:domain, rdfs:range

- **Key notions**
  - **domain of a triple:**
    - the subject
  - **range of a triple:**
    - the object

- **:p rdfs:domain :C -->** the domain of any triple where :p is the predicate is an instance of :C (similar for rdfs:range)

- **Formal meaning:**
  - if (x, y) in P, then x in :C

- **Inference:** type assignment by property usage
Types by usage

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- Key notions
  - domain of a triple: the subject
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- :p rdfs:domain :C -> the domain of any triple where :p is the predicate is an instance of :C (similar for rdfs:range)

- Formal meaning: Inference: type assignment by property usage
Interactions

- All inferences interact to allow complex behavior
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Set intersection

- Proper set intersection is not possible in RDFS
- However, expressing necessary membership to multiple classes is possible, i.e., A subset B AND C

A rdfs:subClassOf B
A rdfs:subClassOf C

consider
x rdf:type A
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One direction only!
Set intersection

- Similar for roles
Set intersection

- Similar for roles
Set union

- Proper set union is not possible in RDFS
- However, A OR B subsetOf C
  
  B rdfs:subClassOf A  
  C rdfs:subClassOf A

  consider
  x rdf:type B

  or
  x rdf:type C
Set union

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Set union

- For roles. Aligning to a global vocabulary
Set union

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Equivalence

- Merging vocabularies
- To account for same use of different terms (classes or properties)
- For classes or properties
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