Semantic Web Technologies RDF Assignment

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Question 1

q1_foaf.rdf file

Question 2

q2_graph file

Question 3

q3 file

Question 4

q4_JSON-LD

JSON-LD is an RDF (Resource Description Framework) serialization standard that allows for the representation of Linked Data in JSON (JavaScript Object Notation) syntax. It enables you to serialize RDF data in a way that web applications and APIs can easily consume.

"JSON for Linked Data" is an acronym for "JSON for Linked Data." It permits the encoding of RDF data as a set of key-value pairs, where each key represents a resource's property or attribute and each value reflects the value of that property.

The @context keyword in JSON-LD is used to convert terms in the JSON-LD document to IRIs (Internationalized Resource Identifiers) in RDF. This enables for the use of vocabulary that is important in the context of a certain application or domain rather than the more abstract and generic words contained in RDF.

JSON-LD is gaining popularity as an RDF serialization format, particularly in the context of online APIs and JavaScript-based web applications. Its use of the familiar JSON syntax makes it easy for developers to work with while yet providing the rich expressive capabilities of RDF.

Question 5

q5 file

Question 6

$riot.bat --output=turtle student.rdf > student.ttl command is used.

The triples produced by converting the "student.rdf" file to. Turtle syntax using Jena command line tools describe relationships between various entities in a university's domain.

@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .   # This triple defines the "rdf" namespace prefix, which is used to refer to RDF vocabulary terms.

@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .   # The namespace prefix "rdfs" defines the "rdfs" namespace prefix, which is used to refer to RDF Schema vocabulary terms.

@prefix uni: <http://aau.at/#> .   # This triple defines the "uni" namespace prefix, which is used to refer to entities with the base URI "http://aau.at/#" in the domain of a university.

uni:studiesAt rdfs:subPropertyOf uni:visits .   # This triple specifies that the "studiesAt" property in the university domain is a subproperty of the "visits" part. This suggests that if a person studies at a university, they also go there.

uni:Student uni:studiesAt uni:AAU .   # This triple indicates that there is a student object in the university domain studying at the university identified by the URI "uni:AAU."

uni:Megan uni:studiesAt uni:AAU .   # This triple indicates that there is a specific student object named "Megan" in the university domain who studies at the same institution identified by the URI "uni:AAU."

uni:studiesAt rdfs:domain uni:Student ;

    rdfs:range uni:University .   # The domain "Student" and range "University" are defined in this triple for the "studiesAt" attribute. As a result, the "studiesAt" property can only be used to link a student entity to a university entity.

uni:Student rdfs:subClassOf uni:Person .   # This triple specifies that the "Student" class in the university domain is a subclass of the "Person" class. This means that every pupil is also a person.

uni:Person rdfs:subClassOf uni:Agent .   # The "Person" class in the university domain is a subclass of the "Agent" class, according to this triple. This means that everyone in the university domain is an agent as well.

uni:Agent rdfs:subClassOf uni:Thing .   # According to this triple, the "Agent" class in the university domain is a subclass of the "Thing" class. This implies that every agent in the university domain is a thing as well.

Figure 1.student.ttl

Question 7

$infer --rdfs student_vocab.ttl student.rdf > inferred_student.ttl command is used

<http://aau.at/#studiesAt> <http://www.w3.org/2000/01/rdf-schema#subPropertyOf> <http://aau.at/#visits> .

<http://aau.at/#Student> <http://aau.at/#studiesAt> <http://aau.at/#AAU> .

<http://aau.at/#Student> <http://aau.at/#visits> <http://aau.at/#AAU> .

<http://aau.at/#Student> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Student> .

<http://aau.at/#Student> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Thing> .

<http://aau.at/#Student> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Person> .

<http://aau.at/#Student> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Agent> .

<http://aau.at/#AAU> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#University> .

<http://aau.at/#Megan> <http://aau.at/#studiesAt> <http://aau.at/#AAU> .

<http://aau.at/#Megan> <http://aau.at/#visits> <http://aau.at/#AAU> .

<http://aau.at/#Megan> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Student> .

<http://aau.at/#Megan> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Thing> .

<http://aau.at/#Megan> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Person> .

<http://aau.at/#Megan> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#Agent> .

<http://aau.at/#AAU> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://aau.at/#University> .

<http://aau.at/#studiesAt> <http://www.w3.org/2000/01/rdf-schema#domain> <http://aau.at/#Student> .

<http://aau.at/#studiesAt> <http://www.w3.org/2000/01/rdf-schema#range> <http://aau.at/#University> .

<http://aau.at/#Student> <http://www.w3.org/2000/01/rdf-schema#subClassOf> <http://aau.at/#Person> .

<http://aau.at/#Person> <http://www.w3.org/2000/01/rdf-schema#subClassOf> <http://aau.at/#Agent> .

<http://aau.at/#Agent> <http://www.w3.org/2000/01/rdf-schema#subClassOf> <http://aau.at/#Thing> .

Figure 2.inferred-student

Turtle file which produces on last question is the representation of an RDF graph's inferred axioms after conducting RDFS inference on it with the Jena RDFS inference engine.

A few classes and characteristics relating to a university domain are defined in the RDF graph. The logical consequences of the original graph and the RDFS semantics are the inferred axioms.

The inferred axioms are:

- studiesAt property is a sub-property of visits.

- Student class is a subclass of Person class.
- Person class is a subclass of Agent class.
- Agent class is a subclass of Thing class.
- studiesAt property has a domain of Student class.
- studiesAt property has a range of University class.
- Student class is a subclass of Thing class.
- AAU resource is of type University class.
- Both Student and Megan resources are of type Student, Person, Agent, and Thing.
- Megan is studying at AAU university.

There are also indirect inferred axioms like the ones because of transivity. For example, the studiesAt property being a sub-property of visits implies that any statements using visits can also be inferred using studiesAt.

Question 8

$infer.bat --rdfs=foaf.rdf axel.rdf > axel-inferred.ttl command is used. Foaf downloaded as rdf because web archive wasn't working.

<http://www.polleres.net/foaf.rdf> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/PersonalProfileDocument>   →   URI http://www.polleres.net/foaf.rdf is of type 'PersonalProfileDocument'.
PersonalProfileDocument is a term in the FOAF vocabulary. This implies that the URI reflects a document that defines a specific individual, and it may include information such as the person's name, email address, and interests.

<http://www.polleres.net/foaf.rdf> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> http://xmlns.com/foaf/0.1/Document → the URI http://www.polleres.net/foaf.rdf is of type 'Document'. This means that the URI denotes a generic document that might include any sort of data.

<http://www.polleres.net/foaf.rdf> <http://xmlns.com/foaf/0.1/maker> <http://www.polleres.net/foaf.rdf#me> → This statement indicates that the creator of the document represented by the URI http://www.polleres.net/foaf.rdf is a person whose URI in FOAF vocabulary is http://www.polleres.net/foaf.rdf#me. This means that the originator or author of the document is the person with the URI http://www.polleres.net/foaf.rdf#me.

<http://www.polleres.net/foaf.rdf> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://www.w3.org/2002/07/owl#Thing> → It signifies that the URI http://www.polleres.net/foaf.rdf is of the FOAF vocabulary type Thing. It shows that the URI represents any form of entity, without defining the type or category it belongs to.

<http://www.polleres.net/foaf.rdf#me> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/Agent> → This statement says that the URI http://www.polleres.net/foaf.rdf#me is of the FOAF vocabulary type Agent. This reflects that the URI represents an agent, which might be a person, group, organization, program, or any other thing capable of performing actions or possessing attributes.

Question 9

```
@prefix rdf:   <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

@prefix rdfs:  <http://www.w3.org/2000/01/rdf-schema#> .# Default

@prefix pet: <http:// www.w3.org/2001/pet#> .      # Just an example

# Classes

pet:Animal a rdfs:Class .

pet:Dog a rdfs:Class ;

   rdfs:subClassOf pet:Animal .


# Properties

pet:parent a rdf:Property ;

   rdfs:domain pet:Animal ;

   rdfs:range pet:Animal .

pet:relative a rdf:Property ;

   rdfs:domain pet:Animal ;

   rdfs:range pet:Animal .

pet:parent rdfs:subPropertyOf pet:relative .


# Jake states that dogs are carnivores.

pet:Jake a pet:Dog .

pet:carnivore a rdfs:Class .

pet:carnivore rdfs:isDefinedBy pet:Jake .


# Wikipedia has also a definition of a dog.

pet:Dog rdfs:seeAlso <https://en.wikipedia.org/wiki/Dog> .


# Define some instances

pet:Blue a pet:Dog .

pet:Gold a pet:Dog .

pet: Blue pet:parent pet:Gold .
```

Figure 3. RDFS ontology