II.3521
Semantic Web and Knowledge Management
2025-2026

TDTPSP_2

RDF, RDFS

Exercise 1: RDF Translation

Given:

```
@prefix s2a: <http://s2a.org/ontology/> .
@prefix uni: <http://s2a.org/university/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
```

Write in English the equivalent of the following triples (in Turtle), which describe the S2A academic domain:

- uni:CS101 rdf:type s2a:Course .
- uni:DrSmith rdf:type s2a:Professor .
- uni:DrSmith s2a:teaches uni:CS101 .
- uni:CS101 s2a:hasCreditValue "3" .
- uni:Alice s2a:hasPassedCourse uni:CS101 .
- uni:Alice rdf:type s2a:Student .
- uni:Bob rdf:type s2a:Student .
- uni:Alice s2a:hasPassedCourse uni:CS101.
- uni:Bob s2a:isEnrolledIn uni:CS101 .
- uni:CS205 rdf:type s2a:Course .
- uni:CS205 s2a:hasTitle "Advanced Algorithms" .
- uni:CS205 s2a:hasCreditValue "4" .
- uni:Alice rdf:type s2a:Student .
- uni:Bob rdf:type s2a:Student .
- uni:Alice s2a:hasPassedCourse uni:CS101.
- uni:Bob s2a:isEnrolledIn uni:CS101 .
- uni:CS205 rdf:type s2a:Course .
- uni:CS205 s2a:hasTitle "Advanced Algorithms" .
- uni:CS205 s2a:hasCreditValue "4" .

Exercise 2. RDFS Hierarchy Definition

Define an RDFS hierarchy for academic programs and their subclasses. Model the following structure in Turtle syntax:

- AcademicProgram (base class)
- UndergraduateProgram (subclass of AcademicProgram)

- GraduateProgram (subclass of AcademicProgram)
- BachelorOfScience (subclass of UndergraduateProgram)
- MasterOfScience (subclass of GraduateProgram)
- PhD (subclass of GraduateProgram)

Exercise 3. Modeling Prerequisites and Student Progress

The "Advanced Algorithms" course (uni:CS205) requires students to have passed "Introduction to Programming" (uni:CS101) as a prerequisite. You will:

1. Define the vocabulary (RDFS) to express prerequisites.
2. Create the instance data (RDF) based on the provided students and courses.

Exercise 4. RDF Data Correction and Completion

1. Identify and correct the 3 errors in the following code (Turtle):

```
@prefix s2a: <http://s2a.org/ontology/> .
@prefix uni: <http://s2a.org/university/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
# Instance Data with Errors
uni:Math201 a s2a:Course .
s2a:teaches uni:DrJones uni:Math201 .
uni:Math201 s2a:hasTitle "Linear Algebra" ;
s2a:hasCreditValue 3 .
uni:Student uni:Charlie .
uni:Charlie s2a:isEnrolledIn uni:Math201 .
```

2. Add triples to state that:
   - Professor "Dr. Evans" (uni:DrEvans) teaches the course "Machine Learning" (uni:CS410),
   - The course "Machine Learning" has a credit value of 4,
   - The student "David" (uni:David) is enrolled in "Machine Learning".

Exercise 5. RDFS Schema Design for Advising Logic

Design an RDFS schema that defines the necessary classes and properties to model the following and write the schema in Turtle syntax.

1. Define a new class s2a:ProgramRequirement;
2. Define two new properties:
   - s2a:isRequirementFor: a property linking a s2a:Course to a s2a:AcademicProgram it is required for. (e.g., uni:CS500 s2a:isRequirementFor s2a:MasterOfScience);
   - s2a:isPartOfProgram: a property linking a s2a:Student to the s2a:AcademicProgram they are enrolled in. (e.g., uni:Alice s2a:isPartOfProgram s2a:BachelorOfScience).

3. Specify the domain and range for these new properties to ensure the data is well-structured;

4. How this Schema Enables "Smart" Advising.