Ontology-Based Recommender System of Online Courses

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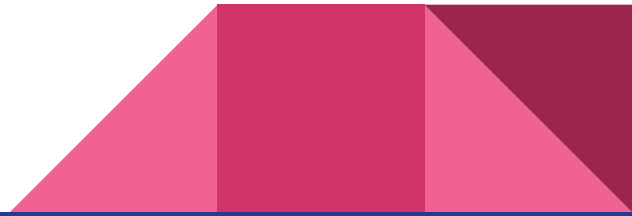
5. Strength and Weakness of Ontology
6. Future Work
7. Conclusion



INTRODUCTION

Introduction

- Finding information regarding online courses from a large number of websites is a challenging and time-consuming process.
- Helping learners to make the correct choice from a myriad of available courses in order to meet their individual needs is a real challenge
- Therefore, we are proposing to use an ontology-based approach to recommends courses.

Purpose of the Ontology

The main purpose of this ontology is to recommend online courses to the online learners taking considerations to their specific requirements.

The ontology is confined to key 3 areas of Computer Science which are

- Data Science
- Computer Engineering
- Computer Networking

The Ontology includes

i) The Organizer of the Course.

ii) The Number of hours required for each course.

iii) The Assessment for the course.

iv) The Fee of the course.

v) The Author of the course.

vi) The Category for the course.(i.e. DS or Networking or Software Engineering)

vii) Last Update of the Course.

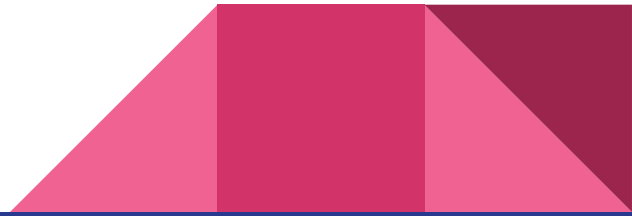
viii) Course Session (Recorded or Live)

ix) Course Prerequisites

x) Course Advancement.

x) Course Rating

xi) Status of Certificates



Intended Use

1. Recommend an appropriate course based on the needs of Learners and their areas of interest.
2. The user will be able to gain precise knowledge about the course.

Intended Users

1. Students: Studying and freshly graduate
2. Working People: Particularly working in Data Science, Networking and Software Engineering
3. People willing to change careers.

Competency Questions

1. Recommend top five rating courses which are free with certificates.
2. List some of the courses for learners who want a certificate after attending the course without having to do assignment, quiz and exam.
3. Mrs. B is working in an organisation and doesn't have time to attend online live courses on Data Scien; recommend some courses for her which are not live session courses.
4. Mr. A is from a management background and he wants to learn some computer networking related courses, ontology shall recommend some courses for him.
5. Mr. C is a new project manager in K-Bank, and he has to develop an information system for ATM machines. What are the courses that will help him to manage the project well?
6. Mrs. D wants to apply for a job and for that job she needs a Software Training course certificate ,and the deadline of the job application is in 1 month. List some of the Software Training courses with certificates that she can obtain within a month (45 hours).
7. Which is the highest rated course of Author XYZ which is free of cost?
8. If I take the ABC course, what are some of the prerequisite courses that I need to attend?
9. List some of the advanced/recommended courses after completing a particular course.
10. Mrs. E has some budget limitation; recommend some courses which are below or equal to 100 Euro to her.

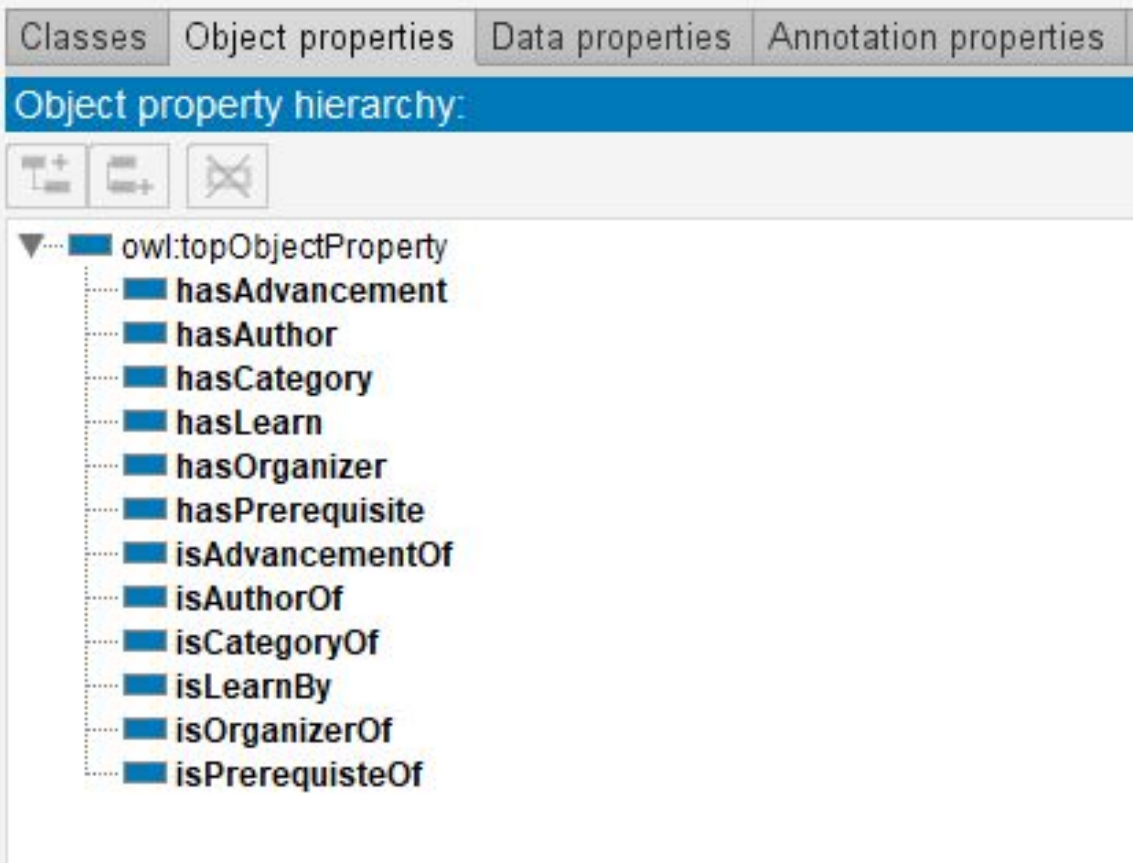
Ontology Class Hierarchy

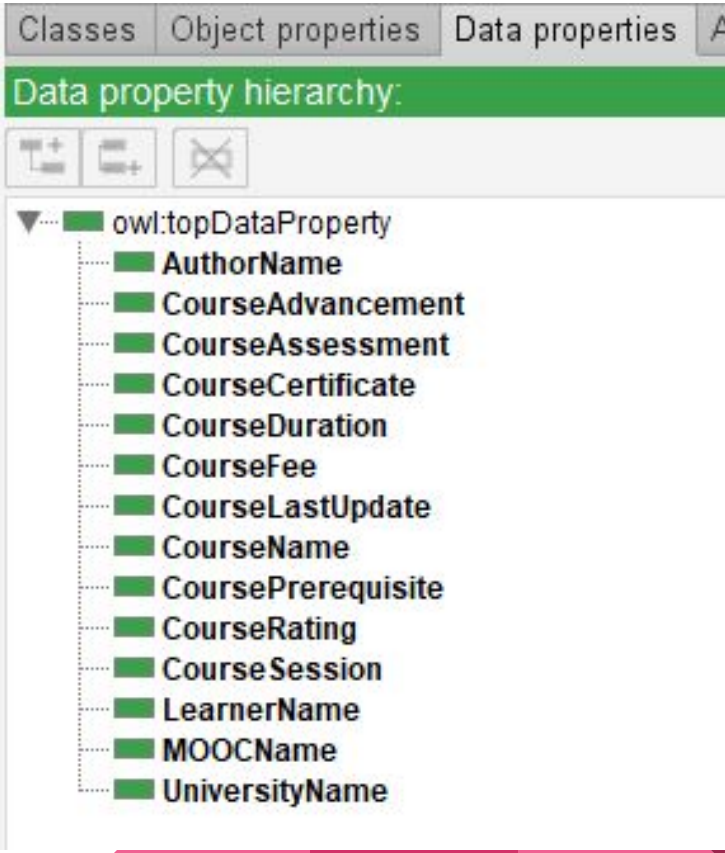
The class hierarchy

1. Course
2. CourseCategory
3. CourseOrganizer
4. Author
5. Learner

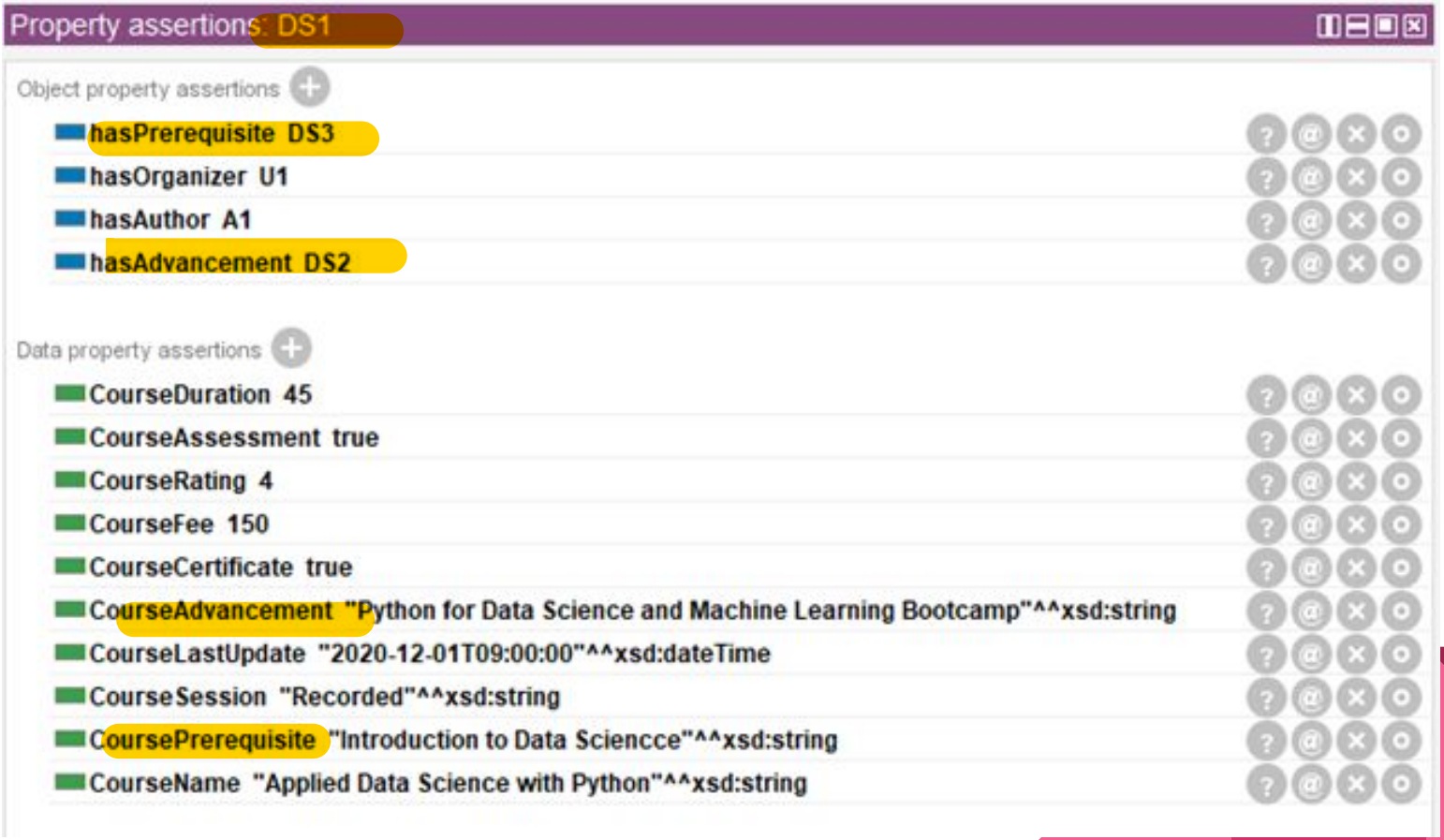
Ontology Properties

Object Properties and Data Properties

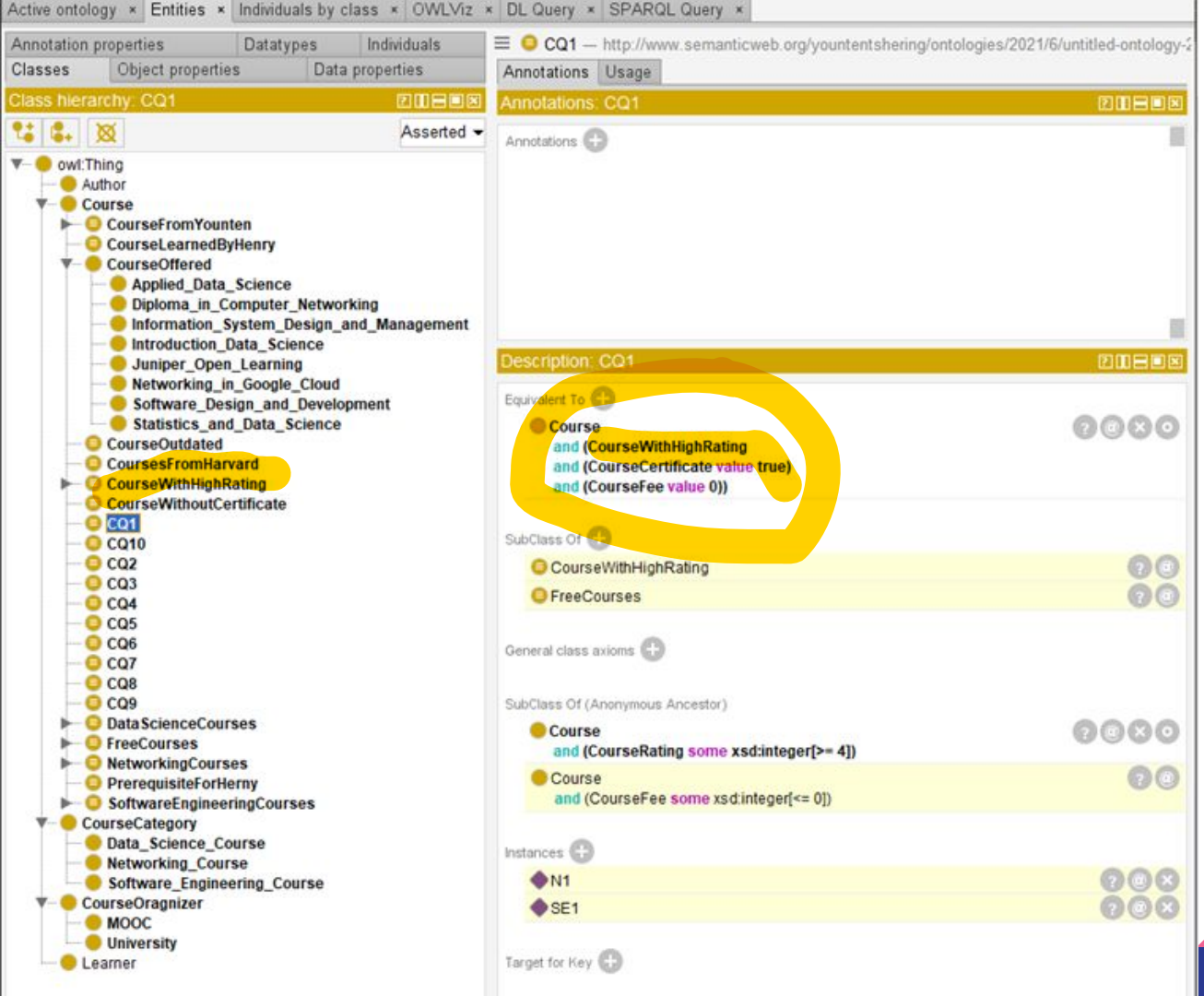




Instances


Property assertions: DS1
Object property assertions
hasPrerequisite DS3
hasOrganizer U1
hasAuthor A1
hasAdvancement DS2
Data property assertions
CourseDuration 45
CourseAssessment true
CourseRating 4
CourseFee 150
CourseCertificate true
CourseAdvancement "Python for Data Science and Machine Learning Bootcamp"^^xsd:string
CourseLastUpdate "2020-12-01T09:00:00"^^xsd:dateTime
CourseSession "Recorded"^^xsd:string
CoursePrerequisite "Introduction to Data Sciencce"^^xsd:string
CourseName "Applied Data Science with Python"^^xsd:string

CQs and SPARQL Query



CQ1

Recommend top rating courses which are free with certificates.

Axiom and instances

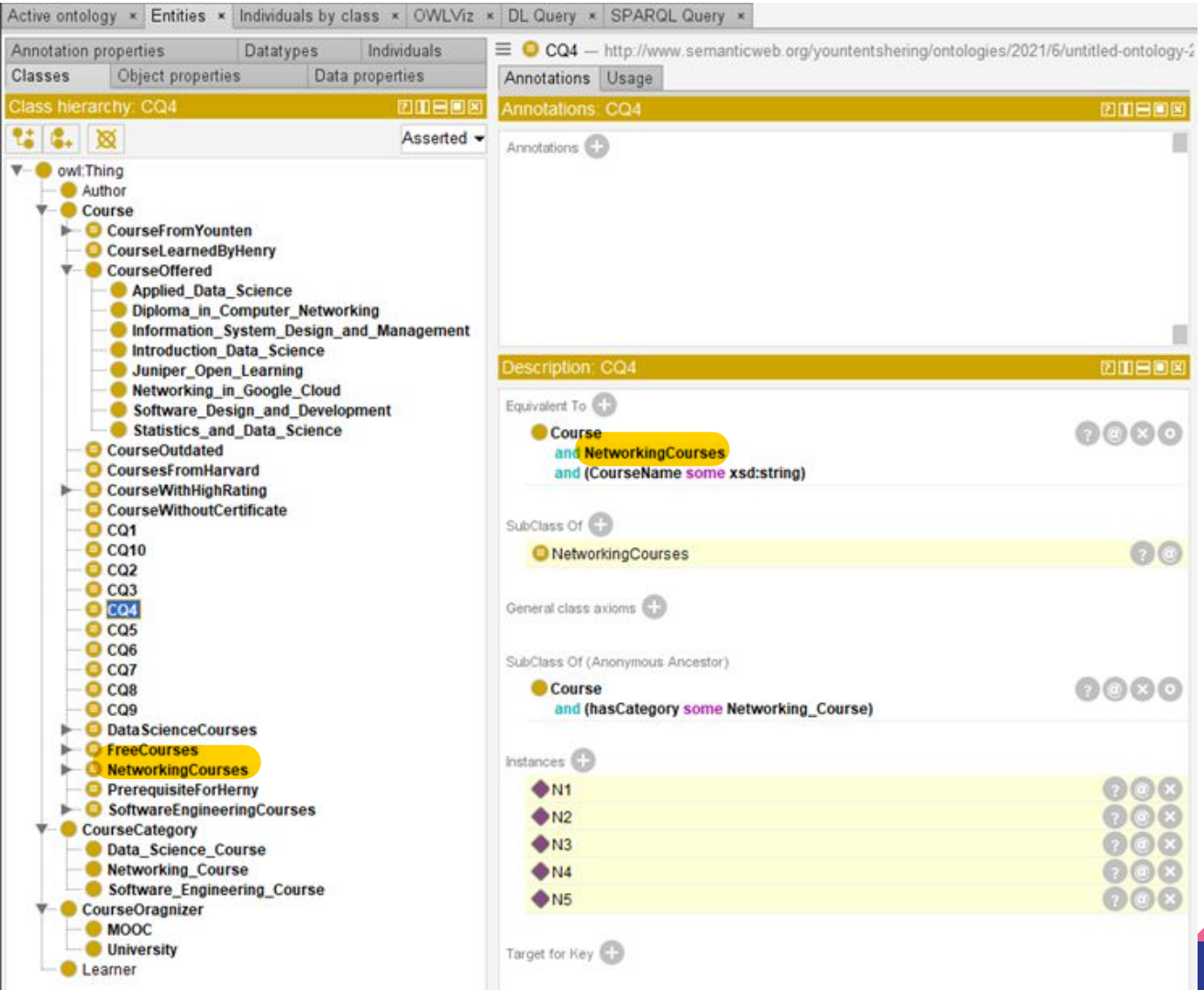
Active ontology × | Entities × | Individuals by class × | OWLViz × | DL Query × | SPARQL Query ×

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX oc: <http://www.semanticweb.org/yountentshering/ontologies/2021/6/untitled-ontology-20#>
SELECT ?Course ?Name WHERE {
        ?Course oc:CourseName ?Name.
        ?Course oc:CourseCertificate true.
        ?Course oc:CourseRating ?R. FILTER (?R >=4)
        ?Course oc:CourseFee 0.
}
```

Execute

?Course	?Name
oc:N1	Juniper Open Learning^^xsd:string
oc:SE1	Software Engineering Training^^xsd:string



CQ4

Mr. A is from a management background, and he wants to learn some computer networking related courses, ontology shall recommend some courses for him.

Axiom and instances

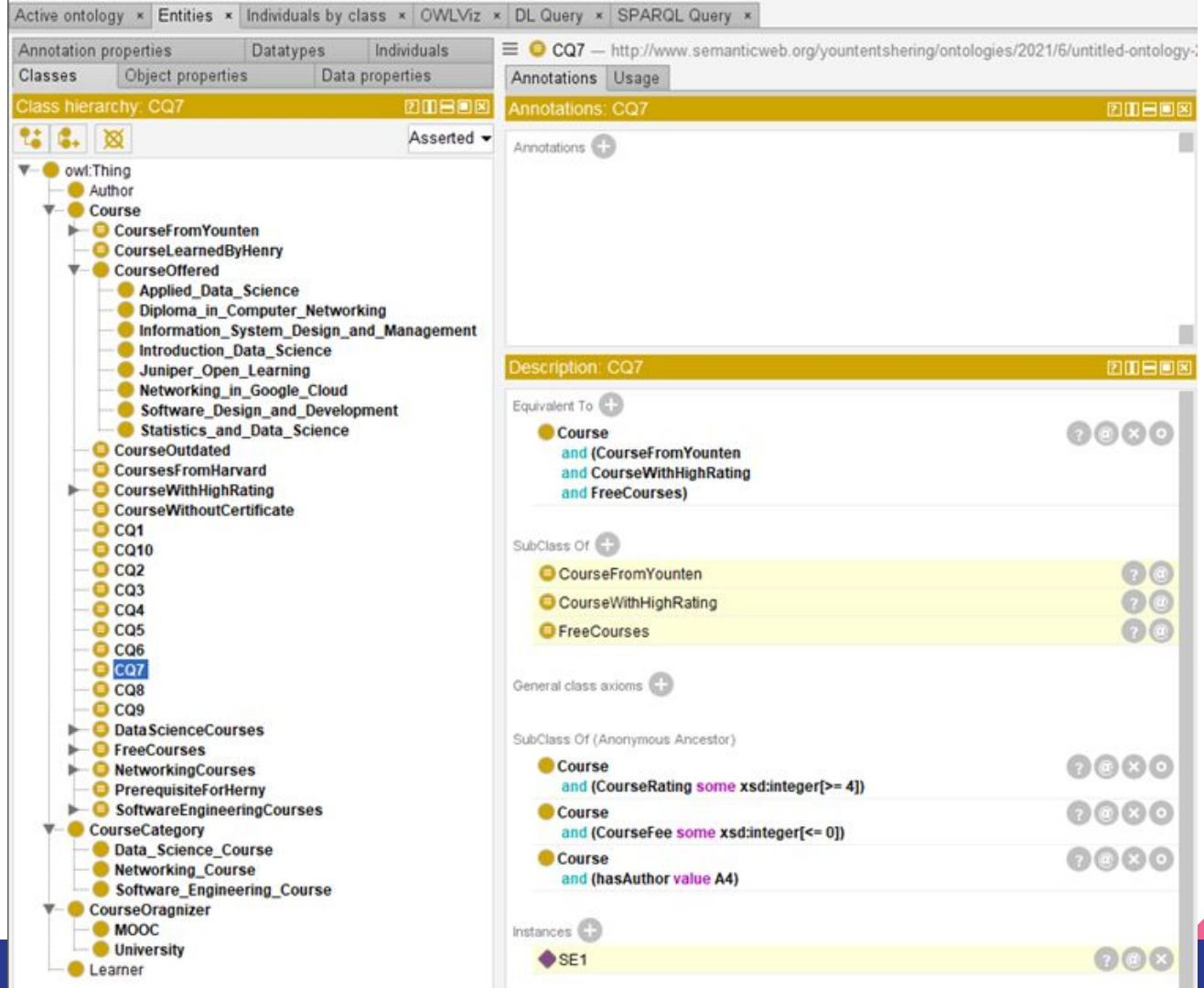
Active ontology × | Entities × | Individuals by class × | OWLViz × | DL Query × | SPARQL Query ×

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX oc: <http://www.semanticweb.org/yountentshering/ontologies/2021/6/untitled-ontology-20#>
SELECT ?CourseCategory  ?Name WHERE {
            ?CourseCategory rdf:type oc:NetworkingCourses.
            ?CourseCategory oc:CourseName ?Name
}
Order by ?CourseCategory
```

Execute

?CourseCategory	?Name
oc:N1	Juniper Open Learning^^xsd:string
oc:N2	Networking in Google Cloud^^xsd:string
oc:N3	The Bits and Bytes of Computer Networking^^xsd:string
oc:N4	Introdution to Open Source Networking Technologies^^xsd:string
oc:N5	Computer Netwoking^^xsd:string



CQ7

Which is the highest rated course of Author XYZ which is free of cost?

Axiom and instances

Active ontology × | Entities × | Individuals by class × | OWLViz × | DL Query × | SPARQL Query ×

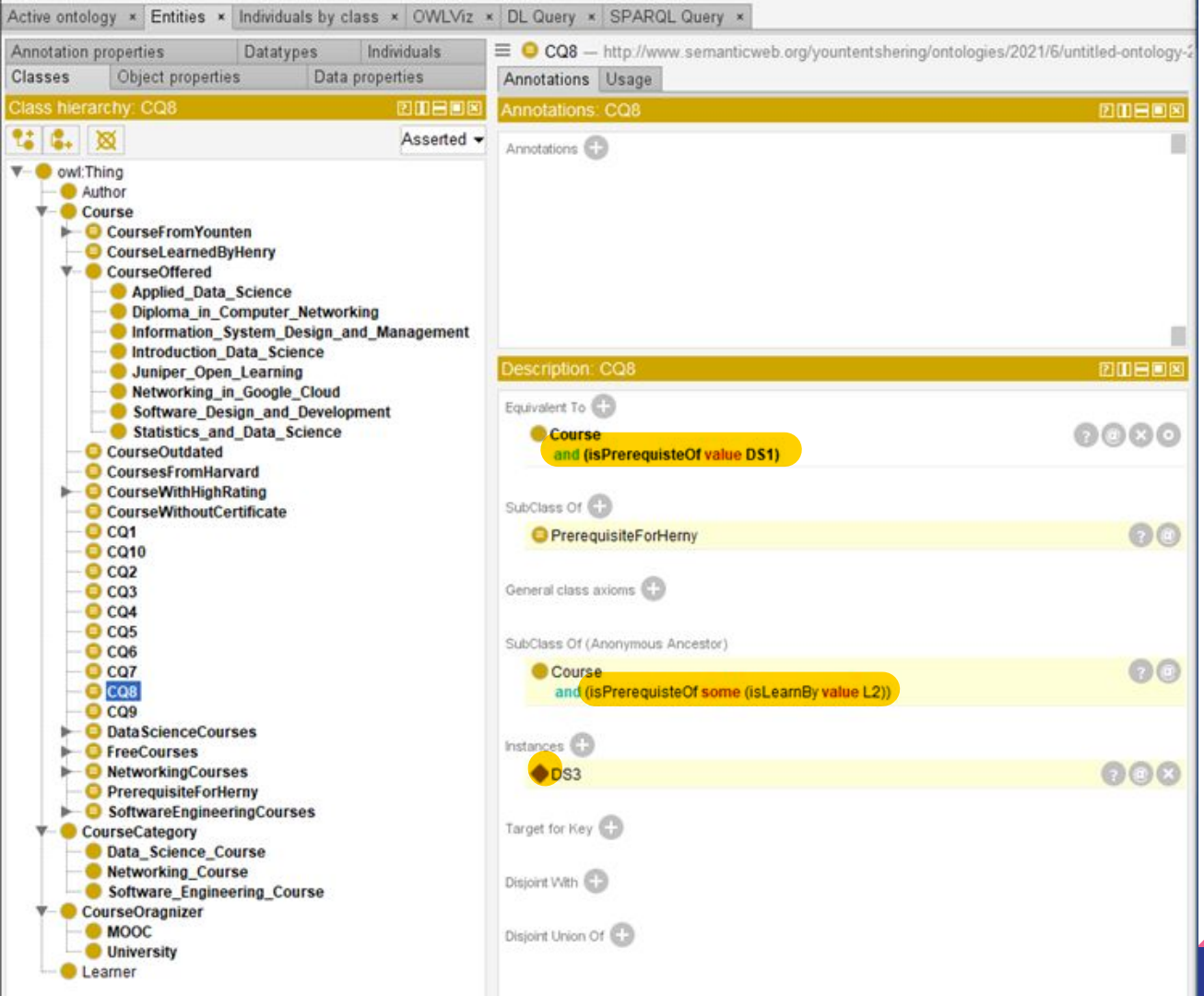
Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX oc: <http://www.semanticweb.org/yountentshering/ontologies/2021/6/untitled-ontology-20#>
SELECT ?Course  ?Name ?Author WHERE {
            ?Course oc:CourseName ?Name.
            ?Course oc:hasAuthor ?a.
            ?a oc:AuthorName ?Author. FILTER regex(?Author, "Younten").
            ?Course oc:CourseFee 0

}
```

Execute

?Course	?Name	?Author
oc:SE1	Software Engineering Training^^xsd:string	Younten^^xsd:string



CQ8

If I take the ABC course, what are some of the prerequisite courses that I need to attend?

Axiom and instances

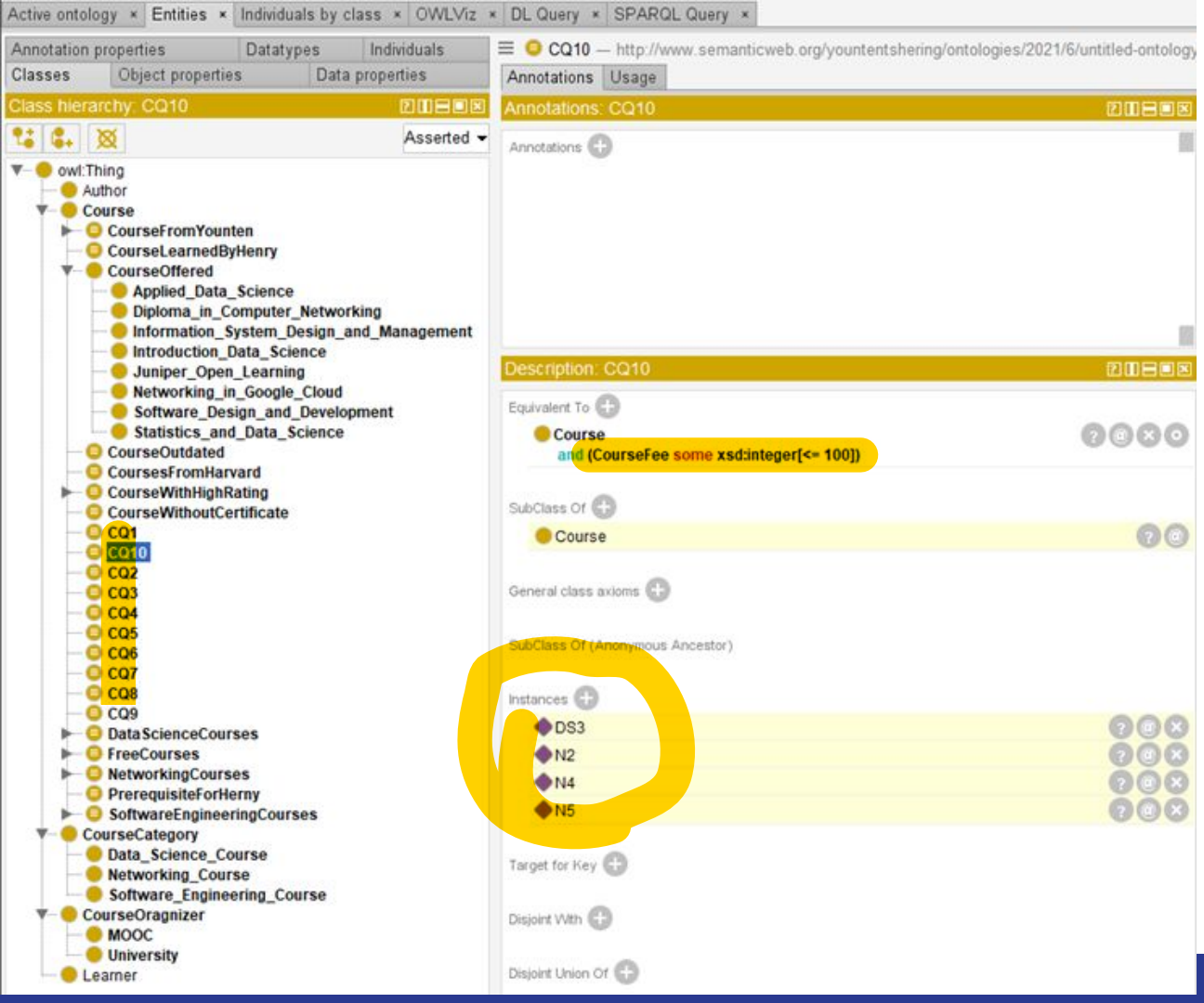
Active ontology × | Entities × | Individuals by class × | OWLViz × | DL Query × | SPARQL Query ×

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX oc: <http://www.semanticweb.org/yountentshering/ontologies/2021/6/untitled-ontology-20#>
SELECT ?Course  ?Name ?Learner ?Prerequiste ?RName WHERE {
            ?Course oc:CourseName ?Name.
            ?Course oc:isLearnBy ?a.
            ?a oc:LearnerName ?Learner. FILTER regex(?Learner, "Henry").
            ?Prerequiste oc:isPrerequisteOf ?Course.
            ?Prerequiste oc:CourseName ?RName
}
```

Execute

?Course	?Name	?Learner	?Prerequiste	?RName
oc:DS1	Applied Data Science with Python^^xsd:string	Henry^^xsd:string	oc:DS3	Introduction to Data Science^^xsd:string



CQ8

Mrs. E has some budget limitation; recommend some courses which are below or equal to 100 Euro to her.

Axiom and instances

Active ontology × | Entities × | Individuals by class × | OWLViz × | DL Query × | SPARQL Query ×

Snap SPARQL Query:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX oc: <http://www.semanticweb.org/yountentshering/ontologies/2021/6/untitled-ontology-20#>
SELECT ?Course ?Name WHERE {
        ?Course oc:CourseName ?Name.
        ?Course oc:CourseFee ?x FILTER (?x <=100 && ?x !=0)
}
```

Execute

?Course	?Name
oc:DS3	Introduction to Data Science^^xsd:string
oc:N2	Networking in Google Cloud^^xsd:string
oc:N4	Introdution to Open Source Networking Technologies^^xsd:string
oc:N5	Computer Netwoking^^xsd:string

Strength and Weakness

Strength and Weakness of Ontology

Strength:

- Effective use of OWL to classify Courses and CoursesOffered into useful inferred subclasses.
- Powerful tool which will save learner's time.

Weakness:

- IRI Design
- KeyWord

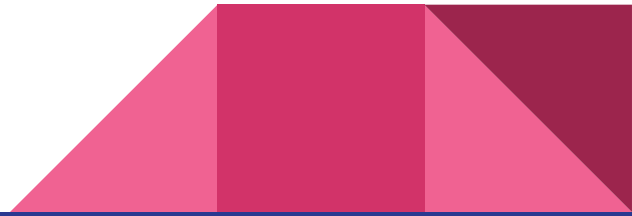
Problem Faced

- We build 4 different ontology before coming up with the final one.
- With continuous supervision and suggestions from our Professor and TA we revised our model.
- We faced some technical problem which were resolved by taking help of internet, our TA and friends.

Future Work and Conclusion

Future Work

- Work on the model weakness.
- Include more classes, real instances and increase the scope of our project.
- Extension such as Job recommender based on the online courses they attended.



Conclusion

- The ontology recommends the learners the online courses as per their requirements.
- 5 classes (Author, Course, CourseCategory, CourseOrganizer, Learners) were developed.
- Properties defined and instance were populated into the ontology
- Constraints were defined
- The system was consistent and all the CQs which were defined earlier were verified.

Feedback and Suggestion

THANK YOU