

## **CS6852: Theory and Applications of Ontologies :: 2023**

**No submitted material can be taken from any internet or other sources. It is understood that students are liable for consequences for violating this. Also, materials submitted for this course can not be used for any other courses/academic credit.**

Read the description of all the assignments before working on the submission of the first assignment.

### **Assignment 1: XML Design**

#### Group task:

Each Team is required to pick a domain of their choice and model the information in the domain using a DTD. Also, populate with data on an appropriate platform. Write a brief description about the design of the DTD. You can study sample DTDs on the internet. However, your submission needs to be your own design.

Individual Task: Each student is required to run an interesting set of XPATH and XQuery queries on the data and submit the results along with the plain English description of the queries. Any tools that support these languages can be used for this purpose. Students are encouraged to cover the various features of XPATH and XQuery in their choice of queries.

Submission guidelines: The group is required to submit the DTD along with a brief description on the domain and XML data. ( Only one person from the group needs to upload this file, on behalf of the group). All members are required to submit the record of the queries and results obtained, with brief comments where necessary.

**Deadline: March 3, 11:55 PM**

### **Assignment 2: Ontology Design**

#### Group task:

Each team is required to create an ontology or semantic model of a domain of their choice. (Consider the same domain from Assignment 1 so that data can be reused.) They need to develop the semantic model using the description logic SROIQ.

Submission guidelines: You are required to submit a pdf document containing 1) List of important pieces of knowledge from the domain that are captured in the ontology. 2) the DL ontology (TBox) and 3) a write-up about the design choices made and the details of the design - the explanations for classes, properties, DL axioms, motivating situations/examples - of the ontology. Please keep the overall goal of the full set of assignments in mind while designing the ontology. You can plan to have members of the primitive symbols (concepts and relationships) available/ extractable from XML data you had generated in Assignment 1.

**Discussion with TA: Dates to be decided.**

**(Further details would be communicated through moodle)**

**Deadline: March 31, 11:55 PM**

### **Assignment 3: Ontology Development**

#### Group task:

Each team is required to produce an OWL Ontology using Protege for the semantic model designed in Assignment 2. The developed ontology needs to be checked for consistency before submission.

Submission guidelines: You are required to submit the OWL file (check consistency before submission) and a pdf file to communicate any comments regarding the OWL file.

**Deadline: April 15, 11:55 PM**

### **Assignment 4: Inference using OWL**

#### Individual task:

Each student is required to develop a program that extracts XML data and combines it with the ontology. That is, take appropriate portions of the XML data created in Assignment 1 and convert them to RDF triples. The triples should be consistent with the OWL ontology of Assignment 3. You should check for consistency using an OWL reasoner. You should infer additional triples by running the reasoner on the ontology and the triples extracted from XML data store. Display both the extracted and inferred triples as the final result of the program.

APIs: You can use OWLAPI in Java/ OWLReady in Python. A nice tutorial on OWLAPI can be accessed from

[http://rad.ihu.edu.gr/fileadmin/labsfiles/knowledge\\_management/TUTORIALS/OWL-API.pdf](http://rad.ihu.edu.gr/fileadmin/labsfiles/knowledge_management/TUTORIALS/OWL-API.pdf).

If you want to use any other language, make sure that it supports all the required components and APIs like OWL reasoners and XPath / XQuery engines.

Submission guidelines: A compressed folder containing the mapping program, XML file, RDF triples, ontology and any other files needed to run the program. An additional readme file containing the instructions on how to run the program.

**Deadline: May 5, 11:55 PM**