Due date: 09/21/2023, 11 am, upload a PDF file and the serialization of your OWL ontology to a folder named 'assignment2' off of the svn repository home directory. In addition, place your owl file on the web (e.g., in the public_html folder of your web space) so that we can use and re-use your ontology.

The purpose of this assignment is to familiarize you with the practical application of OWL 2 ontology constructors. There are several available editors and tools for modeling OWL 2 ontologies, but we will primarily use the OWL 2 compliant Protégé ontology editor and knowledge acquisition system. Please note that this is a substantial assignment, and it's recommended that you don't wait until the last minute to complete it.

1. **(5 points)** To get started, you should first download Protégé from http://protege.stanford.edu/ (current version: 5.6.1). It is best to use the desktop version rather than the web version. Next, you will need to download the Protégé-OWL-Tutorial from our class web page. This document provides a practical guide to building OWL ontologies using Protégé 4, although you may need to adapt some steps since you are using version 5.6. To answer the questions that follow, you will need to read roughly 100 pages from the aforementioned document and I suggest modeling the pizza ontology as instructed in the tutorial. That way you get most familiar with the editor. The document is based on Protégé's default reasoner, HermiT. Once you have completed the necessary work, create a PDF-compiled LaTeX document that includes your answers and upload it to the specified folder.

   (a) (0.25 points) What is an OWL ontology? What are the components within an OWL ontology? Briefly describe them.

   (b) (0.25 points) What are named classes? What are disjoint classes?

   (c) (2 points) Briefly describe the characteristics of the following properties:

      i. Inverse properties.
      ii. Functional properties.
      iii. Inverse functional properties.
      iv. Transitive properties.
      v. Symmetric properties.
      vi. Asymmetric properties.
      vii. Reflexive properties.
      viii. Irreflexive properties.

   (d) (0.25 points) Describe briefly the notion of existential and universal restrictions.

   (e) (0.25 points) What kind of services are offered by an OWL-DL reasoner?

   (f) (0.5 points) What are "necessary", and "necessary & sufficient" conditions?

(g) (1.0 points) Describe two reasoning instances that come across while building the pizza ontology. Explain the reason behind those inferences.

(h) (0.25 points) What is "Open World Reasoning" and "Closed World Reasoning"?

(i) (0.25 points) What is "Unique Name Assumption"?

2. **(5 points)** It is now time for you to create your own ontology. **You only need to model an ontology that covers at least an ALC expressivity in this assignment**. You will extend this ontology in forthcoming assignments until you (might) reach $SROIQ^D$ expressivity. First, you need to select a domain to model an ontology. These are some of the domains that you may consider: *vehicles, universities, stock exchange, language, computers, home environments, animals, birds, games, sports, social networks, etc.*. You may choose another domain of your liking as well of course. Your ontology should contain at least

   - 20-50 concepts,
   - 5-10 object properties,
   - 5-10 data properties,
   - an appropriate number of individuals, and
   - at least five inferred axioms.

Please use the Protégé editor to model the ontology, and make sure that the ontology is consistent by running the reasoner frequently. To save the ontology, you can use the RDF/XML or OWL/XML format.

On the due date of this assignment, you will have 10 minutes in class to present your ontology. Please ensure that you upload the owl file to the public_html folder within your home directory. This will enable everyone to access the OWL file and use it as a reliable source of knowledge on the Internet.