Assignment 1 Write-up

KEVIN RUIZ, University of North Carolina at Greensboro, USA

1 PROBLEM STATEMENT

Assignment 1 for course CSC 429, Artifical Intelligence, Spring 2024, Tasked with three main objectives, Ontology Manipulation and Representation using Human Disease Ontology, Propositional Logic, and Bayesian Network Creation and Inference

2 METHODS

Using Python 3 and multiple libraries such as owlready2, sympy, pgmpy to complete this assignment. As well as applying techniques learned in class reading documentation available and experimenting throughout the time alloted for the completion of the assignment.

Question one was forged to understand the structure of an ontology, using owlready2 I had a number of tasks concisting of the metadata to retrieve comment, count the number of classes/subclasses and compute the average number of child per class as well as searching the ontology for a specific id (DOID:9351) and the label ("type 2 diabetes mellitus") and the goal was to output all of its ancestors. Also my favorite part about this question was creating an ontology with three classes (DM, T1DM and T2DM) I also defined the relationships between these classes, and added the instance of " insulin-dependent diabetes mellitusn to T1DM class, I then saved the file in RDFXML format and that was question one done! Question two in my opinion was very straight forward specially when using the library sympy tasked with creating logical expression involving propositions like A and B our calculations included (1) not A, (2) A or B, (3) A and B, (4) A implies B, (5) B implies A, and (6) a Bioconditional check of A, B task two was to manipulate a given expression to turn it into CNF and DNF using the library Question three was by far the most challenging and time consuming, I really struggled to find online resources to help me and the documentation was a real pain to read. At time I really felt like I was not going to be able to complete this, however through many attempts and headaches I finally had code that compiled. I really struggled when declaring the Bayesian network, the references I could find were outdated to the current version of pgympy, I did want to make the switch to pomegranate however the code was even more confusing, I kept marching forward and after a lot of expirementation and debugging i was sucessful. After finally constructing the Network, Visualization was a piece of cake, and I had a hiccup with Inferences, because again I started using a depricated version of doing it, once I figured it out it went smoothly.

Author's address: Kevin Ruiz, k_ruiz@uncg.edu, University of North Carolina at Greensboro, , Cary, North Carolina, USA, 27513.

3 RESULTS

After completing this Assignment I realized that python has a lot of powerful libraries to ease the task of implementing techniques that we discussed in class. I also started to understand Ontologies more for example the HDO shows a structure that has a lot of hirarchy, and I realized that metadata comments provide a good explanation about the ontology. I also learned that it is very easy to create and define your own ontologies using owlready2. I observed that manipulating basic propositional logic is very easy with sympy, by just declaring the initial state of the proposition you can create many expression very quickly specially something as complex as turning expression into CNF and DNF that was really impressive. One thing that was not straight forward at the start was the Bayesian Network construction, once that was in place though everything that came after that was pretty simple in hindsight

4 SIGNIFICANCE

I think that putting the concepts we learned in class into practice is a great way of learning, this Assignment does give you a taste to the power that python has, given the correct library. I also became a lot more familiar with Bayesian networks because of this, I am much more confident in my ability to discuss the topic.