BIOMEDIN 210/CS 270: Winter 2019
PROJECT MILESTONE & REPORT REQUIREMENTS

Introduction

Many of the ideas described in this course are abstract and may be difficult to internalize in the absence of working on a practical application. To help unify the course topics, you will work on a group project in which you will implement some of the techniques discussed in the lecture to solve a biomedical problem. The project that you develop should be software that exhibits intelligent behavior, includes advanced use of ontology and incorporates problem-solving methods or reasoning. You may build your system in any manner that your team chooses, but we will give full credit only if you can relate your approach to the techniques that are discussed in the lecture.

Groups

Project groups should be 3 to 4 students. We encourage you to make the most out of working as a team - you will learn more this way and it will be more fun. As explained in the first lecture, all of your team members will get the same credit. If you will be working by yourself or in a pair, please consult with the TAs to discuss your situation.

Technologies

Please limit the technologies used to the following:

1) Ontology Modeling
   a) Protégé 5 (OWL DL)
   b) Java/Python UML Diagram

2) Ontology Access
   a) SPARQL Endpoint
   b) OWL API
   c) Java/Python Data Structure

3) Problem-Solving Methods
   a) JESS
   b) SWRL
   c) OWL reasoner
   d) DeepDive/BNLearn
   e) Java/Python Program

Written Deliverables (Due by 11:59pm of Due Date)

Please check the syllabus of the class for the deadline of the deliverables. **You can use your late days for all deadlines, except the poster presentation, final, and peer reviews. However, it will affect the total late days for all team members!**

Please select a teammate who will be responsible for assuring all of the deliverables are complete and on time for the duration of the project. Submit this document in Gradescope (further instructions will follow). When this is done please email your assigned TA and let them know where this document can be found. You will be asked to submit all your code (documented) and OWL files for the final project submission (further instructions will follow).

Project Grade Breakdown

The project is worth 30% of your final grade. We have split the grade, and will be evaluating your project along the following points, each with approximately the same weight:

- Development/Use of Ontology
- Development/Use of Problem Solving Method(s)
- Evaluation Method(s)
- Results write-up
- Discussion write-up and Future Work
- Poster presentation
- **[Bonus]** The WOW factor! (Development of an interactive Web UI, Use of a Visualization method, Mobile App Development – Be creative!)

The components will be weighted as follows:

- Team formation document & mandatory office hours participation **[1%]**
- Project proposal **[2%]**
- Project milestone **[4%]**
- Project presentations (in class) & poster **[6%]**
- Project reports (write-up) **[15%]**
- Project peer reviews **[2%]**

The final project grade will be provided only after the staff reads the final project reports.

Project Proposal

Working in your teams, create the following description of your project.

1) **Paragraph 1:** Address the Biomedical problem you wish to solve with your project. Please be as complete as possible. Please provide several competency questions that you wish to solve with your system. You may revise the problem at a later date as you begin implementing your idea.

2) **Paragraph 2:** Address the following technical needs of your project.
   a) What information will you need to solve your problem?
   b) Where do you find the information mentioned above?
   c) How will you organize this information relationally?
   d) What kind of technology you are planning to use? The teaching team will help you during the mandatory project office hours on 2/1/2019.

3) **Team Structure:** List all team members and briefly discuss their role in the group (e.g.):
   a) Biomedical Researcher/Clinician
   b) Computer Scientist
   c) Data Wrangler
   d) Project Presenter
   e) Poster Designer

An individual can also be a union of two or more roles.

Project Milestone and Final Write-up

To help you build your project report incrementally, we ask you to write the milestone as a mini-version of your final report. In your final report, please let us know whether we can share your final write-up within the future iterations of the class. Your project (milestone and final) reports should include the following sections:

1) **Abstract (0.5 page in milestone and final):** Provide an up-to-date abstract of your project. This should be a brief summary of your whole paper: background; methodological approach; results; discussion.

2) **Background/Motivation (1 p. in milestone, 2 pp. in final):** Give the background information of the problem. Why is it a problem? For whom is it a problem? What other attempts have been made to solve this problem, and how? What were the remaining challenge in the previous attempts that motivated you to work on your project?

3) **Methods (2.5 pp. in milestone, 5 pp. in final):**
   (by "methods", we mean the theory and rationale underpinning each of the buckets below. Discussions of actual implementation should go in the results section.)

   a) **Ontology (1 p. in milestone, 2 pp. in final):** Design a model of concepts, relationships, and axioms that is a conceptualization of your application domain. Describe any data sources (i.e., domain expert, literature) for both the structure of the knowledge model and its instantiation.
      i) *Example: In a clinical guideline execution project, you would develop an ontology of a clinical guideline and instantiate this ontology with data from a specific clinical practice guideline (such as the JNC7 guideline on hypertension management).*

   b) **Problem-Solving Methods (1 p. in milestone, 2 pp. in final):** Develop algorithms or problem-solving methods that would operate on the ontology that you have developed for your application.
      i) *Example: you could develop an algorithm to interpret/reason over the guideline ontology and to send clinical alerts and/or reminders. You could implement this algorithm using rules in SWRL, or you could implement it as a java program.*

   c) **Evaluation (0.5 p. in milestone, 1 pp. in final):** Discuss the evaluation metrics and methods you will use to measure the performance of your approach. For the final project, please describe the results of

your evaluation (Sensitivity, Specificity etc.).

    i)   *Example: if your project is meant to replicate an "expert user's" behavior, find some expert users to look at your system results and "grade" them (e.g., as a "good" result or a "bad" result)*

4) **Results (0-1 p. in milestone, 2 pp. in final):** Provide demonstrations of the detailed results of your data structure, algorithms and evaluation implementation on your problem. This includes both output of your software and the actual final software product. Please attach figures or tables you may have, such as software architecture diagrams or a graphical representation of your ontology.

5) **Discussion/Future work (0-1 page in milestone, 1 page in final):** State the advantages and disadvantages of your current approach. Does your method answer the problems/questions/challenges you mentioned in the introduction? What you have learned from the project? What are the potential future works?

6) **References (no page limit):** Please include all your references.

7) **Division of Labor (< 1 page):** Please give a short statement describing how each team member contributed to the final project.

8) **Appendix/Program submission (no page limit):** Though we will not be evaluating your code, we ask that you submit all code, OWL files, and program executables, instructions on how to run your program, and screenshots of the program execution.