Natural Language Processing
Syllabus – Spring 2016

Course Goals

This is a special projects course in artificial intelligence (AI) with an emphasis on natural language processing. Natural language processing (NLP) is a subfield of artificial intelligence and computational linguistics whose aim is to create computer systems that can communicate using natural (i.e. human) languages. This includes both understanding and generating. There are three goals for this course:

1. To explore the central question of AI: what makes a computer system "intelligent"?

2. To ground the above discussion in mathematical and logical reasoning through the study of standard algorithms in NLP.

3. To provide hands-on practice working on an NLP system

Over the course of the semester, students will work together to create a conversational agent – i.e., a system that can communicate via typed English sentences. Creating a conversational agent will provide the framework necessary to accomplish the course goals.

At the end of this course, students should be able to articulate one possible architecture for creating an AI, provide a high-level explanation of the sorts of problems studied in NLP and an in-depth explanation of at least one NLP algorithm, and appreciate the intricacies that arise when trying to create intelligent systems.

This course is an experiment – a journey that we are all on together! Although I have much of the knowledge and skills we'll need to accomplish our goals, there will inevitably be things that I do not know or have never done. Realistically, we will *not* be able to create a conversational agent that achieves the same level of performance as a human. (We all know this but it's good to say it explicitly). Instead, my expectation is that what we accomplish in this class will serve as a foundation for future NLP classes.

To increase our chances of success in this course, we will abide by the KISS principle: *keep it simple stupid*. The KISS principle instructs us to avoid unnecessary complexity. One practical implication of this principle is that we will use existing systems and implementations whenever possible. We will also try to restrict ourselves to Java and Prolog, using additional programming languages only if absolutely necessary. It is expected that students are proficient in Java. Students are not required to be familiar with Prolog.

Course Details

Instructor: Prof. America Chambers (alchambers@pugetsound.edu, Thompson 405)

Office Hours: MW 2:30pm – 4:00pm, Thurs 1:15pm – 2:45pm (or by appointment)
If my door is open, even if it's not official office hours, you are more than welcome to stop by.

Course Time and Place: MWF 11 – 11:50pm in Thompson 399

Course webpage: The Google site URL is `https://sites.google.com/site/cs425nlp/`

Textbook: There is no required textbook for this class. Readings will be provided as needed.

Note on availability: I'm not available on Tuesdays and I don't respond to emails late at night or on Saturdays.

Course Structure

This course can be roughly split into two parts: before spring break and after spring break. Before spring break, we will be covering all the topics necessary for us to begin working on our conversational agent. These topics include:

- Week 1: What's so hard about NLU?

- Week 2: Architectures for conversational agents

- Week 3-4: Syntax, parts of speech, context-free grammars, and parsing

- Week 5: Semantic interpretation

- Week 6: Dialogue act prediction

This is a tentative list that is subject to change. During this time, students will also be learning Prolog. After spring break, the course will transition into a project-based course.

Grading: Grades in the course are based on four components:

10%	Reading responses
20%	Prolog assignments
20%	Attendance and participation
50%	Group project

Readings: Each topic will have corresponding required readings. The readings will be quite diverse – e.g., conference publications, newspaper articles, textbook chapters, book chapters, documentation for data sets, etc. It is *extremely* important that you come to class having done the reading both for the sake of our class discussions but also because we will be using (or implementing) the algorithms discussed in the readings. Some reading assignments will have a corresponding written response that will be turned in at the beginning of the class period.

Prolog Assignments: Prolog is a logic programming language that is extremely useful for many NLP tasks. Students will be learning Prolog throughout the course of the semester. There will be (at least) 4 Prolog programming assignments aimed at familiarizing students with the basics of Prolog and with the use of Prolog for building a conversational agent.

Group Projects: After spring break, students will be split into groups and each group will be given responsibility for some portion(s) of the conversational agent. This will take a good amount of self-supervision and self-direction. In particular, I anticipate some groups will require a substantial amount of reading, planning, and discussion before they can even begin programming! On Fridays, we will have group updates in-class. We will discuss the group projects in more detail later in the semester

Attendance: Finally, 20% of your grade is based on attendance in class, participation in course discussions, and contributions to the development of the course Google site. Students have edit permission for the Google site and are encouraged to create pages, create content, or modify/organize content on the site for the benefit of everyone.

Academic Accommodations

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Student Accessibility and Accommodations, Howarth 105, pperno@pugetsound.edu, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Classroom Emergency Response Guidance

Please review university emergency preparedness, response procedures and a training video posted here. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.