



CSCI-499: Natural Language for Interactive AI
Units: 4
Fall 2022 MoWe 10am-11:50am

Location: TBD

D-Clearance Request:

https://docs.google.com/forms/d/e/1FAIpQLScyWk8I_VoHfomhxVACB3e44jYqO4CYW9EspNaHoYMQVxfJA/viewform?usp=sf_link

Instructor: Jesse Thomason

Office: SAL 244

Office Hours: TBD

Contact Info: jessetho@usc.edu; emails will be addressed within 48 hours.

Course Description

This course will explore how natural language can serve as an interaction medium between users and AI agents. To that end, the course will cover topics in natural language processing, computer vision, and machine learning. Students will become familiar with concepts and methods in natural language processing and linguistics such as syntactic and semantic parsing, structure prediction, distributional semantics and compositional semantics. Students will delve into the intersection of planning and search-oriented machine learning algorithms with such language understanding techniques and paradigms.

Learning Objectives

1. Gain familiarity with a diverse set of NLP concepts and techniques.
2. Gain familiarity with planning formalisms for learning-based AI agents.
3. Become familiar with and develop new techniques and applications for language as an interface between AI agents and human users.

Prerequisite(s): CSCI-270 && (CSCI-360 || CSCI-467 || equivalent experience)

Recommended Preparation: Fluency with python programming.

Course Notes

Lecture notes will be made available online after each class.

Required Readings and Supplementary Materials

All reading material will be posted on the course web page at the beginning of the course. All reading material will be freely and publicly available online.

Description and Assessment of Assignments

Paper reviews

The course will explore the course topics through a series of assigned readings in the form of research papers (and book chapters). Students will be assigned 1-2 research papers to read for a given week and submit a one page review for 1-2 of the assigned reading papers as homework. There will be 8 (+ 1 optional) such paper reviews assigned through the semester. Reviews will be assessed based on answering the following 5 questions (based on clarity and correctness):

1. What is the main problem/task addressed by the paper?
2. What was done before, and how does this paper improve on it?
3. What is the one cool technique/idea/finding that was learned from this paper?
4. What part of the paper was difficult to understand?
5. What generalization or extension of the paper could be done?

Coding Assignments

Students will iterative build up a language-guided AI agent in a simulated environment by implementing techniques studies in class. The assignments will be graded based on completion and correctness.

Class Presentation

Students will present individually or in small groups a research paper to the class. The paper will be selected from a list of papers selected by the instructor, or outside of the selected list with instructor permission. Each presentation will be 20 mins. The presentations will be graded on clarity, completeness, and presentation style.

Semester Project

Students will work individually or in small groups to carry out a class project. The focus of the class project will be to develop an innovative use of natural language as an interaction method between a user and an AI agent. Students will leverage tools, concepts, and techniques presented in the class. The project involves identifying a communication need that language could resolve, data sources (such as simulation environment, demonstration data, language data) available to inform the problem and method, and the techniques needed to approach it. Project topics will be suggested by the instructor, and also students will have the freedom to propose their own. The grade for the project will be based on the successful completion of the agreed upon project objectives. The deliverables include a project proposal (1-2 pages single space), a mid project report (4-8 pages single space), final presentation (10-20 minutes) and a final report (10-15 pages single space). They will be graded based on clarity, and completeness. The project is total 55% of final grade with the following breakdown:

Proposal (5%)
Project Mid Report (10%)
Final Presentation (10%)
Project/Final Paper (30%)

Grading Breakdown

Including the above detailed assignments, how will students be graded overall? Participation should not exceed 15% of the total grade. Where it does, the syllabus must provide an added explanation. No portion of the grade may be awarded for class attendance but non-attendance can be the basis for lowering the grade, when clearly stated on the syllabus. The sum of percentages must total 100%.

Assessment Tool (assignments)	Points	% of Grade
Class participation	100	10%
Paper reviews (x8)	12.5 x 8	10%
Coding Assignments (x4)	25 x 4	10%
Class Paper Presentation	100	15%
Final Project	100	55%

Assignment Submission Policy

Upload/email to be decided, encouraged by 6pm (aka “quittin’ time”) on the due date; accepted until 11:59pm on the due date.

Grading Timeline

Grades will be provided within 2 weeks of submission of the respective assignment.

Additional Policies

This is a discussion-based course, hence consistent attendance is expected. Lack of attendance will affect the class participation score. Missed classes with a valid excuse are allowed. Class participation will be scored based on engagements in course discussions.

The course will allow for a “late day budget” per student to be enumerated in full at the beginning of the course. In essence, this will be a set of pre-allowed late days that can be taken on any assignment to be used in lieu of individual or case-by-case late days. This budget can be used for sickness, personal delays, and additional time on assignments with no justification or explanation for taking the late time required. Going over budget (e.g., turning things in late with no late days to expend) will incur grade penalties.

Course Schedule: A Weekly Breakdown

Provide a detailed course calendar that includes a list of deliverables (homework assignments, examinations, etc.) broken down on a weekly basis. The format may vary, but the content must include:

- Subject matter (topic) or activity
- Required preparatory reading or tasks (e.g., viewing videos)
- Deliverables and when each deliverable is due. A blanket statement that there will be a deliverable due at a specified frequency (e.g., there will be homework due weekly) may obviate the need to state when certain deliverables are due

IMPORTANT:

In addition to in-class contact hours, all courses must also meet a minimum standard for out-of-class time, which accounts for time students spend on homework, readings, writing and other academic activities. Standard fall and spring sessions (001) require a final summative experience during the University scheduled final exam day and time.

	Topics/Daily Activities	Deliverables ›
Week 1	Introduction + History of Interactive AI	
Week 2	Basics of text processing: data, tokens, clustering, document classification	Paper review 1
Week 3	Sequence tagging and structure prediction: syntax and semantics	Coding assignment 1: semantic parsing
Week 4	Basics of planning: MDPs, reinforcement learning, state representations	Paper review 2 Coding assignment 2: reinforcement learning
Week 5	Planning and Learning: POMDPs, visual and text observations	Paper review 3 Project Proposal
Week 6	Distributional semantics: word and sentence embeddings	Paper Review 4
Week 7	Student Paper Presentations	Paper Presentation Optional Paper Review
Week 8	Student Paper Presentations	Paper Presentation Paper Review 5
Week 9	Learning from demonstration: sequence to sequence models	Paper review 6 Coding assignment 3: imitation learning
Week 10	Language as action: dialogue systems, human-in-the-loop learning	Project mid report
Week 11	Deep learning I: transformers, vision stacks, multimodal fusion	Paper review 7
Week 12	Deep learning II: transformers, vision stacks, multimodal fusion	Paper review 8 Coding assignment 4: dialogue
Week 13	Physical systems: speech recognition, gaze, gesture	
Week 14	Project Presentations	Project Presentations
Week 15	Project Presentations	Project Presentations
FINAL	Project Report	Project Report due on the final exam date; refer to the schedule at classes.usc.edu .

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press “0” after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symlicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.