CSCI644: Natural Language Dialogue Systems
Units: 4
Fall 2018—Thursdays — 3pm - 6:20pm

Location: SOS B41
Course webpage: http://projects.ict.usc.edu/nld/cs644f18/

Instructor: David Traum
Office Hours: RTH 512 2-2:45pm Thursday or after class or by appointment at ICT
Contact Info: traum@ict.usc.edu

Teaching Assistant: Setareh Nasihati Gilani
Office: Physical or virtual address
Office Hours: Tuesdays 3:30pm-5:30pm, TBA
Contact Info: sngilani@ict.usc.edu

Course Description

This course will introduce students to existing computational techniques and active research areas in the design of natural language dialogue systems. Natural language dialogue involves extended communication between two or more participants using a natural language such as English. Dialogue systems are designed to participate in extended natural language interactions with human users, and have been developed for a variety of interactive settings where a conversational interface offers advantages. Dialogue systems leverage a range of natural language processing and modeling techniques to help them serve as fluent and efficient conversational partners. This course will introduce students to these techniques, with topics to include spoken language understanding, modeling dialogue genres, dialogue management and representing context, dialogue response policies, natural language generation, embodied conversational agents, incremental speech processing, and dialogue system evaluation.

Dialogue systems are both an old topic in AI and Computer Science (with famous early examples such as Eliza, Lunar, and SHRDLU) and a topic of much current interest and research. Indeed, dialogue systems are now a commercial reality, with companies such as Google, Amazon, Nuance, Microsoft, IBM, Apple, and others providing ubiquitous speech recognition services and voice-driven information access systems. These services are increasingly accessible (on the web, mobile devices, and in the cloud), and they provide exciting new possibilities for dialogue systems to be made available to large user populations. Throughout the course, students will acquire an appreciation for some of the capabilities and potential of these new technologies, as well as their current limitations.

Learning Objectives
Students should come away from the course with a basic understanding of dialogue system design, implementation, and evaluation, and the tradeoffs between different approaches to dialogue system creation, given goals and available resources, and be able to:
- implement simple dialogue systems
- read and assess research papers in the area
- design a dialogue system for a specific task
- embark on new research on dialogue modeling and dialogue system

Recommended Preparation: Students should have some experience with natural language processing or artificial intelligence, and should be comfortable with medium-sized programming projects. Recommended background would be at least one of the following courses: CSCI 544 (Applied Natural Language Processing) or CSCI 561 (Foundations of Artificial Intelligence) or CSCI 662 (Advanced Natural Language Processing) or EE619 (Advanced Topics in Speech Recognition). Students who have not taken one of these courses should request permission from the instructor.

Course Notes
The course lecture periods will consist of approximately 1/2 lectures by the instructors, and 1/2 group discussion of research papers, mostly led by students. For

all class periods, students will be responsible for sending in discussion questions on the readings, as well as participating in class discussions. Each student will have to co-lead the discussion of one advanced research topic, including a short review presentation on the topic. Students will also complete several small assignments, and carry out a main project on a topic agreed by the instructor. Blackboard will be used for submitting assignments. Lecture notes will be posted on the course webpage or Blackboard site. Discussion questions should be posted on the course Piazza site.

Technological Proficiency and Hardware/Software Required
Students are expected to know how to program in a language such as Java, C++, or Python. Students are also expected to have access to their own laptop or desktop computer where they can install and run software to do the homework assignments.

Required Readings and Supplementary Materials
The primary readings for this course will be a set of technical papers to accompany each lecture session and student-led topic. These papers will be made available on the course webpage or as class handouts.

Description and Assessment of Assignments
Basic comprehension of the material will be assessed by student's class participation and sending in questions about the readings. In-depth understanding of one area will be assessed by the student leading a discussion of the area, including a summary lecture presentation. Practical understanding of simple evaluation and system building will be assessed through a set of assignments of one to three weeks duration. In-depth research capability to be assessed through completion and presentation of a class project.

Grading Breakdown

There will be no exams in this class. Grades will be determined based on

1. reading and reviewing assigned papers (sending in questions)	10%
2. participation in class discussions	10%
3. co-leading one discussion topic based on assigned readings	10%
4. 3 small assignments	30%
5. main project (including one page description, project design specification, final writeup & class presentation)	40%

Assignment Submission Policy

Assignments are to be submitted electronically in Blackboard. Questions should be submitted to Piazza at least one hour before class.

Additional Policies

Students are expected to miss no more than 2 classes throughout the semester. Students may use up to five days for late assignments.

Course Schedule: A Weekly Breakdown (Readings are approximate, please see the course website for up-to-date information)

	Topics/Daily Activities	Readings and Homework	Deliverable/ Due Dates
Week 1	Overview of dialogue systems	Jokinen & McTear Ch. 1 Traum 2017	Assignment 1 distributed
Week 2	Models of dialogue structure, Speech Act Basics, Simple dialogue processing techniques	Jokinen & McTear Ch. 2.1-2.1.1, 2.3, Traum 1999a	Assignment 1 due Assignment 2 distributed
Week 3	Frame-based Approaches, Information-state approaches, Plan-based and logic-based approaches	Jokinen & McTear Ch. 2.1.2, 2.2, 4, 5.1 Traum & Larsson 2003	Assignment 2 due Assignment 3 distributed
Week 4	Role-play dialogue for training, Dialogue systems to represent real people	Traum 2012, Traum 2016,	
Week 5	Dialogue System data collection and evaluation	Jokinen & McTear Ch. 6 Walker et al 2000 Artstein et al 2009	Assignment 3 due Choice of presentation topics due
Week 6	Social Grounding and error-handling	Jokinen & McTear Ch. 3 Traum 1999b	
Week 7	Special Topics #1		Project proposal due
Week 8	Special Topics #2		
Week 9	Information Retrieval Approaches to Dialogue and NPCEditor Special topics #3	Leuski & Traum 2011	
Week 10	Special Topics #4		
Week 11	Deep Learning Approaches to Dialogue Systems Special topics 5	Li et al 2015 Serban et al 2016	
Week 12	Reinforcement Learning Approaches to Dialogue and Simulated Users	Jokinen & McTear Ch. 2.4 Georgila et al 2005	Project specification due
Week 13	Special topics 6		
Week 14	Thanksgiving – no class		
Week 15	Student project presentations		Project presentation
FINAL	Student project presentations		Project presentation Final project writeup due

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, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. dps.usc.edu