Meaning in Language: Brains and Machines (LING449R)

Spring 2017

Course Information
Meaning in Language: Brains and Machines (LING449R)
Times: Tuesday and Thursday 12:30-1:45pm
Location: MMH 1304

Contact Information
Instructor: Allyson Ettinger
Office: MMH 1407B
Email: aetting@umd.edu
Office hours: Tuesday and Wednesday 2-3pm

Other information
Course website: ELMS
Prerequisite: Instructor permission. Students should have two courses in LING or CS, or equivalent background in relevant topics.
Text: There is no textbook for this class. All readings will be provided.

Course description: Natural language is a vital aspect of human society, and "meaning" represents the apex of what language has to offer: the capacity to encode and convey information, flexibly, unboundedly, and with great nuance.

This course seeks to explore the concept of "meaning" in language, drawing on three different disciplines: linguistics, cognitive neuroscience of language, and computer science. We will look at how people seek to understand and model "meaning" within these three disciplines, as well as at research that seeks to bridge the disciplines.

Course goals: After taking this course, students should be able to demonstrate 1) an ability to read and understand current research on meaning, particularly in cognitive neuroscience of language (CNL) and natural language processing (NLP), and 2) an ability to critically evaluate and draw connections between research in these different domains.

Expectations and grading procedures:

1. **Participation.** This course is a seminar, so you will be expected to do readings and participate regularly in class discussions.

2. **Reading responses.** You will be expected to make short responses on readings. This will involve posting to the ELMS discussion board a thoughtful, substantive comment and/or question about the reading, before the start of the class period for which that reading is assigned.

In total you are required to post *at least 20 responses* (for 20 different class periods)—this is slightly less than one response per assigned reading, so you can skip responses for a small number of readings without any penalty.

3. **Paper presentation.** Each student will choose one paper on which to give a presentation/lead the discussion in class. Your presentation should last roughly 20-30 minutes and should include slides or a handout. You should give a summary of the paper, highlighting important issues that it addresses and points that it makes, and give a sense of its significance within the context of what we have been discussing in class. *You are required to meet with me at least once beforehand to discuss the paper and your presentation.*

   Note that we are covering challenging material in this class. It is okay if you don't understand every part of the paper that you present. However, you do need to be able to give a presentation that is clear and reasonably complete, so it is important that you give yourself time to read and process the paper, and that you come and meet with me before the presentation (after you have read the paper).

4. **Final project.** You will complete a project pertaining to some aspect of meaning in linguistics, cognitive neuroscience of language, NLP, or a combination thereof. Detailed guidelines for the final project will be made available later in the semester, but note that you will be able to choose between a variety of project types, including the following:

   - Design a human experiment testing an aspect of meaning in language.
   - Propose a model to address an aspect of meaning in NLP.
   - Design a computational model of a cognitive process pertaining to meaning in language.
   - Do a literature review on a topic relevant to meaning in linguistics / CNL / NLP.

   Final project components

   Proposal. Due April 6. Submit online a one-page proposal for your project. This should be a brief description of the topic you have chosen and a list of at least 3 references read / to be read. You are strongly encouraged to schedule appointments throughout the semester to discuss topic ideas or your work in progress.

   Draft. Due April 25. Submit online a short draft/"outline-plus" of your paper. This should clearly outline the organization of your paper, and give a partially fleshed out version of what you plan to say in each of the paper's sections.

   Presentation. In class May 9 and 11. You will give a short presentation of your project in class. You should bring a handout and/or use slides. Further guidelines will be announced.

   Paper. Due May 18. Submit online. Further guidelines will be announced.

Grading will be weighted as follows:

Participation: 10%
Reading responses: 20%
Paper presentation: 20%
Final project: 50% (Proposal 10%, Draft, 10%, Presentation 10%, Paper 20%)

Grading scale:

98-100 = A+	93-97 = A	90-92 = A-
87-89 = B+	83-86 = B	80-82 = B-
77-79 = C+	73-76 = C	70-72 = C-
67-69 = D+	63-66 = D	60-62 = D-
59 and below = F		

See undergraduate catalogue for description of grades, e.g., A+, A, A-, etc.: `http://www.umd.edu/catalog/index.cfm/show/content.section/c/27/ss/1584/s/1534`

Communication about this course: I will use email to convey important information, and students are responsible for keeping their email address up to date, and must ensure that forwarding to another address functions properly. Failure to check email, errors in forwarding, and returned email are the responsibility of the student, and do not constitute an excuse for missing announcements or deadlines.

Emergency protocol: If the university is closed for an extended period of time, watch for announcements via ELMS outlining the adjustments to be made to the course schedule and format.

Course schedule:
(Any changes to this schedule will be announced via ELMS.)

Date	**Topic**	**Reading**	**Assignment due** (not incl. reading responses)
	Intro		
Thursday 1/26	Studying meaning from different angles		
	Meaning at the word level		
Tuesday 1/31	Word meanings in linguistics	Heim and Kratzer 1998, Chapter 1	
Thursday 2/2	WordNet: A curated approach to word meanings in NLP	Miller et al. 1993 (Intro to WordNet, Nouns in WordNet)	
Tuesday 2/7	Semantic priming and some explanatory models	McNamara 2005, Chapters 1, 2, 5	
Thursday 2/9	Distributed / vector representations	Turney and Pantel 2010	
Tuesday 2/14	Background material: neural networks and optimization	Karn 2016, Nedrich 2014 (blog posts)	
Thursday 2/16	Word representations derived from neural networks	Bengio et al. 2003 (optional: Mikolov et al. 2013)	
Tuesday 2/21	Words with multiple meanings: CNL	Swinney 1979	
Thursday 2/23	Words with multiple meanings: NLP	Jauhar et al. 2015	

Tuesday 2/28	TBA	TBA	
Thursday 3/2	Predicting brain activations with vector representations (guest instructor Naomi Feldman)	Mitchell et al. 2008	
Meaning at the phrase and sentence level			
Tuesday 3/7	Phrase and sentence composition in linguistics	Heim and Kratzer 1998, Chapter 2	
Thursday 3/9	Semantic role labeling: identifying event components	Màrquez et al. 2008 (optional: Banarescu et al. 2013)	
Tuesday 3/14	Meaning and context in the brain: the N400	Kutas and Federmeier 2000 (optional: Kutas and Hillyard 1984)	
Thursday 3/16	Using the N400 to study meaning processing	Federmeier and Kutas 1999	
Break!			
Tuesday 3/21	Spring break		
Thursday 3/23	Spring break		
Composition models in NLP (unsupervised)			
Tuesday 3/28	Simple composition functions with fixed embeddings	Mitchell and Lapata 2008	
Thursday 3/30	Learning embeddings for fixed composition function	Fyshe et al. 2015	
Tuesday 4/4	Review of unsupervised composition models	Hill et al. 2016	
Thursday 4/6	Lecture on key concepts / catch-up	TBA	Project proposal
Composition models in NLP (neural, supervised)*			
Tuesday 4/11	Sentiment-supervised, syntax-guided composition	Socher et al. 2012	
Thursday 4/13	Syntax-supervised composition	Bowman et al. 2016	
Tuesday 4/18	What neural composition models are learning	Li et al. 2015	
Applying computational models for understanding brain data*			
Thursday 4/20	Predicting the N400 (model trained on synthetic data)	Rabovsky et al. 2016	
Tuesday 4/25	Predicting the N400 (models trained on natural data)	Frank et al. 2013	Project paper draft
Thursday 4/27	Localizing semantic roles in the brain	Frankland and Greene 2015	
Wrap-up			
Tuesday 5/2	*Students' choice*	TBA	
Thursday 5/4	*Students' choice*	TBA	

Tuesday 5/9	Final presentations		(Project presentations)
Thursday 5/11	Final presentations		(Project presentations)
Finals			
Thursday 5/18			Project paper

*We may switch the order of these two sections if appropriate.

A student may seek to reschedule final examinations so that he or she has no more than three (3) examinations on any given day. It is the responsibility of the student to initiate the rescheduling or be responsible for taking the examination as originally scheduled.

Course Procedures and Policies: A full list of course-related policies and relevant links to resources may be found at: `http://www.ugst.umd.edu/courserelatedpolicies.html`

Policy on late work: Reading responses will not be counted if they are submitted after the start of the class period for which the relevant reading is assigned.

For other assignments, late submissions will be accepted (with the exception of submissions made after / too closely before grades are due), but will be penalized 10% for each day (or portion of a day) that they are late, up to 50%.

Attendance and Absences: Students are expected to attend classes regularly. Consistent attendance offers students the most effective opportunity to gain command of course concepts and materials. Events that justify an excused absence include: religious observances; mandatory military obligation; illness of the student or illness of an immediate family member; participation in university activities at the request of university authorities; and compelling circumstances beyond the student's control (e.g., death in the family, required court appearance). Absences stemming from work duties other than military obligation (e.g., unexpected changes in shift assignments) and traffic/transit problems do not typically qualify for excused absence.

Students claiming an excused absence must notify the course instructor in a timely manner and provide appropriate documentation. The notification should be provided either prior to the absence or as soon afterwards as possible. In the case of religious observances, athletic events, and planned absences known at the beginning of the semester, the student must inform the instructor during the schedule adjustment period. All other absences must be reported as soon as is practical. The student must provide appropriate documentation of the absence. The documentation must be provided in writing to the instructor by the means specified in this syllabus.

The full university attendance/absence policy can be found here: `http://www.ugst.umd.edu/courserelatedpolicies.html`

Academic integrity: The UMD Honor Code prohibits students from cheating on exams, plagiarizing papers, submitting the same paper for credit in two courses without authorization, buying papers, submitting fraudulent documents and forging signatures. On every examination, paper or

other academic exercise not exempted by the instructor, students must write by hand and sign the following pledge:

I pledge on my honor that I have not given or received any unauthorized assistance on this examination (or assignment).

Allegations of academic dishonesty will be reported directly to the Student Honor Council: `http://www.shc.umd.edu`

Disability Support: Students with a documented disability should inform the instructors within the add-drop period if academic accommodations will be needed. You are expected to meet with your instructor in person to provide them with a copy of the Accommodations Letter and to obtain your instructor's signature on the Acknowledgement of Student Request form. You and your instructor will plan together how accommodations will be implemented throughout the semester. To obtain the required Accommodation Letter, please contact Disability Support Service (DSS) at 301-314-7682 or dissup@umd.edu

Copyright notice: Class lectures and other materials are copyrighted. They may not be reproduced for anything other than personal use without written permission from the instructor. Copyright infringements may be referred to the Office of Student Conduct.

Academic accommodations for students who experience sexual misconduct: The University of Maryland is committed to providing support and resources, including academic accommodations, for students who experience sexual or relationship violence as defined by the University's Sexual Misconduct Policy. To report an incident and/or obtain an academic accommodation, contact the Office of Civil Rights and Sexual Misconduct at 301-405-1142. If you wish to speak confidentially, contact Campus Advocates Respond and Educate (CARE) to Stop Violence at 301-741-3555. As 'responsible university employees' faculty are required to report any disclosure of sexual misconduct, i.e., they may not hold such disclosures in confidence. For more information: http://www.umd.edu/ocrsm/

Diversity: The University of Maryland values the diversity of its student body. Along with the University, I am committed to providing a classroom atmosphere that encourages the equitable participation of all students regardless of age, disability, ethnicity, gender, national origin, race, religion, or sexual orientation. Potential devaluation of students in the classroom that can occur by reference to demeaning stereotypes of any group and/or overlooking the contributions of a particular group to the topic under discussion is inappropriate. If you have any concerns about the inclusiveness of this class or the way that it is being conducted, feel free to come to me to raise those concerns.

For information on ELMS, counseling, health, learning workshops, tutoring, writing help, student rights in undergrad courses, questions about graduation or add/drop/withdraw, please see `http://www.ugst.umd.edu/courserelatedpolicies.html` .