

COGNITIVE SCIENCE SEMINAR (COMP/PHIL/PSYC 7514/8514)

FALL 2011

Time: Wednesdays 2:30 pm - 5:30 pm

Place: 405 Fedex Institute of Technology

Instructor: Andrew Olney

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Description

Computational cognitive models are perhaps the defining feature of cognitive science. Computational cognitive models require that both mental representations and the computational processes that use them be fully specified. However, across the field of cognitive science there is substantial disagreement about the kinds of mental representations and computational processes involved in cognition.

Disagreement about mental representations includes not only their basic form, e.g. logic, analogies, or neural activity, but also how these representations are related to each other or linked. These links between mental representations seem to be inherently caught up in our sense of meaning. Indeed, in the famous Chinese Room argument, Searle concludes that arbitrary symbols manipulated by a program have no meaning and are not constitutive of minds. Meaning is a key characteristic of human cognition and should be part and parcel of mental representations.

In this seminar, we will explore representations of meaning – mental representations that are linked to other mental representations, including representations of the world (perceptual representations). Because much research in meaning representations involves language, we will examine current theories of language representation, including Bayesian, vector space, logical, and hybrid statistical/logical models. In addition we will discuss non-human meaning representations as evidenced by research on animal cognition, including numerosity and language.

The public portion of the seminar takes place on Wednesdays at 4pm in FIT 405. Faculty and students who would like to meet with external speakers before or after the seminar are encouraged to contact me.

Objectives

- Learn Bayesian, vector space, logical, and hybrid statistical/logical models for representing meaning
- Study previous applications of these paradigms to representing meaning
- Independently apply one or more paradigms in an paper/project

Methods and Activities

- Reading assignments completed before class
- Prepare questions before class
- Class lecture and discussions
- Self-directed project/paper

Materials

The primary readings will come from journal articles aligned with the course schedule below. Readings will be distributed via the course website <http://cogscimeaning11.blogspot.com>

Computer access is required for most project options, and laptop access during class will be an advantage. Students without laptops may consult with the instructor for alternatives.

Grading

Research Paper/Project (80%) You must submit a final paper in APA format suitable for conference publication. The paper must report your independent work involving representations of meaning. However, within these constraints there are several options.

Theoretical papers are acceptable and must be at least 8 pages long. These papers must contribute some original insight into representing meaning. For example, others have compared distributional and feature based models to determine if distributional models can approximate feature based models (note this is not an option for the class because it would not be original). Such a paper would discuss the problems of comparing models, how distributional methods solve these problems, and how the results would be analyzed. Note that though this example is theoretical, it is highly specified in terms of algorithm and analysis.

Toolbox papers that use an existing toolbox and report independent computational work must be at least 8 pages long. Many toolboxes exist that provide an environment for creating new cognitive models, and these can simplify the process for students with less programming background. However, the model described in the paper can not be a “demo” from the toolbox, nor can it be a minor modification of a demo. The model created must be an independently created model, using the toolbox’s primitives. Hint: don’t think you can do this at the last minute using a toolbox, because any toolbox will take you a month to learn how to use.

Project papers that write their own code and report independent computational work may be as little as 4 pages, but all supporting source code must also be submitted.

All papers must include a literature review that describes previous work in that area and motivates the question addressed by the paper. **Prior to beginning work, contact the instructor with your paper idea and which of the 3 categories you believe it fits into.** The instructor will either accept, reject, or modify your proposal. **If you turn in a paper without the instructor’s acceptance of your idea and length, your paper may not be acceptable. Unacceptable papers will receive little or no credit, resulting in a low grade for the course..** On the final two sessions of class, we will have a roundtable discussion/presentation of topics. You will be expected to give a brief 5-10 minute description of your paper in one of these classes (just verbally, without slides unless you prefer slides) . Your paper is due in hardcopy on the final day of class. Please also email PDFs (PDFCreator is a free program for Windows).

Response to Readings (20%) Your response will be a blog entry on the class website <http://cogscimeaning11.blogspot.com> BY NOON THE DAY BEFORE CLASS that makes text-to-text, text-to-self, or text-to-world connections and discusses your opinions of these ideas. Each of the readings should be covered to some extent, but the readings can be given different weights in your entry. For instance, you can choose to expand on one reading over the others as long as you deal with all the readings in some way. You can pose a question, e.g.

“I found Millers theory of memory confusing. What is a bit? Is it just a mathematical idea, or is it something we can easily see in the world around us? For example, if I...” (a brief paragraph)

or you can elaborate on the reading, e.g.

“I’m not sure I agree with Millers theory regarding chunking. It seems to me that there must be some limit to the number of chunks at some point. For example...” (a brief paragraph)

“I find Millers chunking idea interesting. It actually relates directly to the way I perceive music. For example...” (a brief paragraph)

“If Millers theory of chunking were true, imagine what would happen to someone if their chunking abilities were destroyed through brain damage. I imagine this might...” (a brief paragraph)

In addition, each paper will have one “lead student” who will prepare a presentation summarizing both the reading and all the comments on the blog for the rest of the class. The presentation will take place at the beginning of the class and serve as the jumping off point for class discussion. A 5-10 minute presentation with or without powerpoint is ideal. Students will bid before the second class for the days on which they want to present at this website <https://dudle.inf.tu-dresden.de/58urlgle/>. Click on one day only.

Course Format

The format will be a blend of class discussion based on the assigned readings, lecture, and demonstrations of computational models. Student participation in class discussion and student preparation of questions for class discussion are key features of the format.

Attendance

Since class participation is a significant portion of your grade, tardiness and missing classes will negatively impact your grade.

Make-up Policy

Work is expected to be turned in on time unless arrangements have been made prior to the due date. No credit will be given for late work. Please plan ahead and arrange to be present for all classes (listed on course schedule, attached). Extensions are given only under extreme circumstances and with prior permission of instructor.

Course Announcements

Course announcements as well as consultation with the instructor may occur via e-mail messages. Each student must maintain an e-mail account and is responsible for checking for course messages daily. Students are also responsible for notifying the instructor if their e-mail address changes during the term. The University of Memphis offers free e-mail services to students. Students without an e-mail account can bring their university ID cards, swipe them, and set up an account at the Smith or McWherter computer labs or students can bring their cards to the information technology helpdesk, room 124 in Administration Building for assistance.

Cell Phones and Electronic Devices

Please turn off your cell phone before class begins. Any device that produces a noise, e.g. a ringtone, should be silenced before class. Any student making or receiving calls during class will be asked to leave for the duration of the call.

Getting Help

If you have any difficulties during the course, let me know immediately. See me during office hours or contact me by email. It is important to notify me as soon as possible if you think you are losing track. Keep in mind: not asking questions is always worse than asking questions you think are silly (instead, often those questions turn out to be challenging!).

Office Hours

Office hours are the perfect opportunity to discuss teaching and research issues. Do you want to have more information on a certain topic? Do you have difficulties finding a research question or writing a paper? Do you feel uncomfortable about assignments? Are you looking for work in a research lab? Do you have suggestions or comments? See me during office hours or send me an email.

Special Accommodations for Disabilities

Reasonable and appropriate modifications will be provided to students with disabilities who present a memo from Student Disabilities Services (110 Wilder Tower; phone: 678-2880). Students must take the following actions to obtain disability accommodations and services at The University of Memphis:

- Register with the Student Disability Services Office and provide the Office with appropriate qualifying medical or psycho-educational documentation that establishes the existence of a qualifying disability and provides a rationale for reasonable accommodation, if applicable.
- Make their disability related needs and specific requests known in a timely manner to the appropriate people, such as their Student Disability Services Coordinator, their professors or other relevant staff ; and
- Follow the established procedures of the University and the Student Disability Services Office for acquiring needed services, accommodations and adjustments.

The University is not responsible for providing services or making academic accommodations or adjustments until the above conditions have been met. Disability accommodations are not retroactive but go into effect at the point these conditions have been met. For more information see <http://saweb.memphis.edu/sds/> and <http://policies.memphis.edu/UM1480.htm>

Eating, Drinking, and Smoking

Eating and drinking are allowed in class as long as the noise and smell are not disruptive to other students. Decisions regarding food will be made by the instructor on a case-by-case basis. Smoking is not permitted at any time indoors, according to Tennessee law.

Academic Integrity and Student Conduct

Plagiarism or cheating may result in your case being referred to the Academic Discipline Committee that addresses academic misconduct. This decision is up to the discretion of the instructor. Students are expected at all times to behave in accordance with the American Psychological Association Code of Ethics. Expectations for academic integrity and student conduct are described in detail on the website of the Office of Student Judicial and Ethical Affairs (<http://saweb.memphis.edu/judicialaffairs>). Please take a look, in particular, at the sections about “Academic Dishonesty,” “Student Code of Conduct and Responsibilities,” and “Disruptive Behaviors.” I will expect students to be aware of these guidelines and to conduct themselves accordingly. I take academic honesty extremely seriously. I will not tolerate any form of plagiarism, cheating or other cases of academic dishonesty and am obligated to notify the chair of the department and take serious actions through university channels in those circumstances. For instance, whenever your research papers contain other researcher’s ideas, make sure you reference them in the appropriate format. Keep in mind that sophisticated computer technologies are able to detect plagiarism from articles, the Internet and/or student essays. In sum: Be honest

Conflict Resolution

If you have a conflict with the instructor or another student in the classroom, please see the instructor after class or during office hours. The classroom is not the appropriate place to pursue personal differences or disagreements.

Visitors in the Classroom

Visitors to the class will be accommodated so long as they are not disruptive and do not detract from the instruction of enrolled students. Decisions regarding visitors will be made by the instructor on a case-by-case and class-by-class basis.

Diversity in the Classroom

Diversity means the fair representation of all groups of individuals, the inclusion of minority perspectives and voices, and the appreciation of different cultural and socioeconomic group practices. We aspire to foster and maintain an atmosphere that is free from discrimination, harassment, exploitation, or intimidation. Academic courses will aim at providing opportunities for students to discuss issues of diversity including, but not limited to, ethnicity, gender, disability and sexual orientation as they can be related to course content. The University of Memphis has adopted policies prohibiting discrimination based upon race, sex, disability, or sexual orientation. In addition, the American Psychological Association has explicit policies regarding the issues of and writing about race, gender, class, sexual orientation, disability, ethnicity, and religion. You may find information on these standards in the APA Publication Manual or on the APA webpage: <http://www.apa.org/pi/oema/>.

Syllabus Changes

The instructor reserves the right to make changes as necessary to this syllabus. If changes are necessitated during the term of the course, the instructor will immediately notify students of such changes both by individual email communication and posting both notification and nature of change(s) on the course bulletin board.

Course Schedule

| Date | Speaker | Topic |
|----------|-----------------|---|
| 08/31/11 | Andrew Olney | Introduction |
| 09/07/11 | David Blei* | Graphical models |
| 09/14/11 | Andrew Olney | Concepts |
| 09/21/11 | Roger Kreuz | Non-literal language |
| 09/28/11 | Xiangen Hu | A theory of semantic spaces and some applications |
| 10/05/11 | Mike Jones* | Vector space models |
| 10/12/11 | Vasile Rus | Meaning representations |
| 10/19/11 | John Sowa* | Conceptual graphs |
| 10/26/11 | Andrew Olney | Logic |
| 11/02/11 | Pedro Domingos* | Markov Logic |
| 11/09/11 | Stephan Blatti | Animal cognition |
| 11/16/11 | Michael Ferkin | Representations in voles |
| 11/23/11 | Ulrike Griebel | Language acquisition in animals |
| 11/30/11 | | Student presentations |
| 12/07/11 | | Student presentations |