Advanced Topics in Cognition, 2014
Coordinator: Sanjay Chandrasekharan
TA: Prajakt Pande

Credits: 4
Duration: 16 weeks, class starts 2 January
Time: Monday and Thursday, 2 to 4 PM (Saturday classes will make up for any holidays)

Summary
This course will explore the different theoretical perspectives on the nature of cognition (behaviorism, symbolic cognition, connectionism, distributed cognition, dynamic systems, ecological psychology, situated cognition, embodied cognition). The focus will be on the recent theoretical approaches, particularly distributed, situated and embodied perspectives, and the cognitive and brain mechanisms that support these perspectives.

Learning Objectives
The primary objectives of the course are: 1) provoking alternate ways of thinking about cognition, and 2) exploring what these views suggest about the nature of learning and education. A related objective is gaining familiarity with the empirical methods, argument structures and conventions used in the study of cognition, particularly experiments reported in recent literature.

For participants who do not intend to pursue research in cognition and related topics, the course would be useful in developing skills needed to pursue social science research. Particularly: 1) how to pull out key arguments from complex text; 2) how to evaluate the merits of an argument, 3) how to relate a theoretical perspective to a given topic and understand its implications, and 4) how to critique an established view, and develop and defend an alternate thesis.

Reading Material
The course requires significant reading (60-100 pages a week; ~60 papers). The readings will be a mix of popular articles and philosophical, experimental and modeling papers. Some papers will be technical, but the discussion will focus on theoretical issues rather than technical details. The title for each week in the course plan below indicates the general gist of the articles.

All readings are available (pdf) from the link below. Each week's readings are in a separate folder, with 4 (rarely 5) core readings. These are given numbers 1 to 4-5, at the end of the filename. The key points would be easier to grasp if the papers are read in this order. This ordering is also provided in the course plan below. Some folders have a subfolder named "Extra". This contains a few other papers and material to pursue if the topic is found interesting. Week 16 folder has some assorted papers.

The readings are difficult, previous students found discussing the material once among themselves before coming to class quite helpful. This possibility should be explored.

http://gnowledge.org/~sanjay/Advanced_Cogsci_Course

Class Structure
The class will be participant-driven and discussion-based. The class strength will be limited to around 15 active participants. Each week's readings would be presented by a team of two participants, possibly in two sections. This cycle will continue throughout the course. All participants are requested to read the text beforehand, so that there is a common base to discuss and critically analyse the issues raised by the papers.

All participants have to turn in a "Comments and Queries" (C&Q) document every Monday to the TA, focusing on the week's readings. See Note 1 for guidelines on what is expected in this document. The Comments and Queries could also be used to frame the discussion in the class. Participants who are presenting the material in a given week need not submit this document for that week, but generating these would be useful in guiding the discussion. The TA will provide feedback on your C&Q documents and the presentations. See Note 2 for guidelines on the structure of presentations.

Assessment
Students taking the course for credit will be graded on the basis of a final term paper (50%) as well as the Comments and Queries document and presentations (50%). Each C&Q/presentation carries 10 marks. Your C&Qs and presentations together should total a minimum of 10 submissions.

The final term paper should preferably connect the student's interest in education with one of the topics covered in the course. A rough outline of the term paper should be submitted by March 15. See Note 3 on what is expected for the term paper.

Course Plan

Week 1 (January 2)
Introduction, background, course outline, presentation schedule, groups, primers etc.

Week 2 (January 13, 16)
Behaviorism and the Standard Model of Cognition
Watson, Skinner, Miller, Newell

Week 3 (January 20, 23)
Reforming the Standard Model: Connectionism
Garson, Hinton, Farah, Sidenberg

Week 4 (January 27, 30)
Reforming the Standard Model: Distributed Cognition
Hutchins, Hutchins, Bohannon, Kirsh, Kirsh

Week 5 (February 3,6)
Evidence for Distribution of Cognition
Kirsh, Martin, Shcwartz, Uttal

Week 6 (February 10,13)
Possible Mechanism: Incorporation of external structures into body-schema
Maravita, Yee, Constantni, van der Hoort

Week 7 (February 17, 20)
Possible Mechanism: Resonating others' actions
Knoblich, Sebanz, Decety, Taylor

Week 8 (February 24, 27)
Rejecting the Standard Model: Dynamic Systems
Van Gelder, Smith, Thelen, Sievers

Week 9 (March 3,6)
Rejecting the Standard Model: Ecological Psychology
Reed_Gibson, Tucker, Ramenzoni, Makris

Week 10 (March 10,13)
Rejecting the Standard Model: Situated Robotics
Brooks, Braitenberg, Kirsh, Chandrasekharan
See the robotvideos folder for some implementations.

BREAK

Week 11 (March 24, 27)
Rejecting the Standard Model: Situated Cognition
Kirsh, Lave, Cleermans, Atas

Week 12(March 31, April 3)
Possible Mechanisms: Extremes of Plasticity
Bach-Y-Rita, Ramachandran, Thaler, Guterstam

Week 13 (April 7, 10)
Rejecting the Standard Model: Embodied Cognition
Glenberg, Thomas, Schubotz, Bak

Week 14 (April 14, 17)
Evidence: The experiential basis of memory, imagination, language, numerosity and emotion
Schacter, Wohlschlager, Matlock, Shafir, Domahs

Week 15 (April 21, 24)
Emerging Trends: Self-control, the Immune-System, the Microbiome, Epigenetics
Gailliot, Mischel, Zimmer, Dobbs, Costandi

Week 16 (April 28): Reflection

Note 1: Comments & Queries

1) A summary of the papers is not expected. If summarising helps you in understanding the material, you should still do it. But keep that part as a separate file, and refer to the summaries when you run into problems or get stuck while conceptualizing/writing your final paper/proposal/thesis.

2) Queries with the following structure are not useful: "how can we use (say) mental imagery for education/design"? There is no clear answer to this question, because it is too general. It would be better if you turn such questions into something like: "in math/science education, there is this problem of XYZ, and the author's ideas seem to imply that strategy ABC would be useful/would not work, is this right?" or something along these lines. To do this, you will have to do some focused thinking about the author's ideas, and apply it to a problem you are familiar with. If you have a question like this, other people can contribute to the discussion, and maybe even help you solve a problem.

3) Comments along the lines of "this view is interesting", "the author has done a good job" etc. are not useful. Comments should show close engagement with the ideas in the papers. So something like "the author's position seems to contradict/support the position of (another) author X in the following way" or "the data seems to be showing X, but it does not seem to support the author's claims" or "the author argues for X, but it has the following implication, which is undesirable" etc.

4) Before writing your C&Q, try to think a little more deeply about the implications of the ideas presented by the authors, and also try to connect their ideas with other things you have read, in the class or outside. This would help you come up with C&Qs that are closer to the description above.

Note 2: Presentations

All presentations should follow the structure below:

1)What is the major claim of the paper?
2) What design/data/arguments support the claim?
3) How well does the design/data/argument support the claim? What are the main problems?
4) What would be other/better ways to support the claim?
5) What implications follow from the claim, particularly for education?
6) Any details you would like to highlight

Using 1 slide for each of these questions would be the ideal format. Aim for a 15 minute presentation for each paper. Presentations for each day can be upto 30 minutes in total.

Note 3: Term Papers

The following points should be kept in mind while picking your topic for the term paper, and during writing of the paper.

1) The paper should be around 15-25 pages, single space. Why is this an important point? Because you should choose a topic that *requires* that much space for discussion. If you choose a very broad topic, you will not be able to do justice to it in this amount of space. If you choose a very narrow topic, you will not have enough things to say to fill that amount of space. The size of the

paper is a good way to "scope" your topic.

2) The paper should have an argument. That is, it should have some clearly articulated premises, and a conclusion that follow from these, preferably with some discussion of data/results that support the conclusion. For instance, you can argue that neuroscience research is irrelevant for science education. Or you can argue that imagery research can inform physics learning. But you should give reasons for why you think this is the case. The requirement for an argument means the paper cannot be a literature review, a discussion of a new approach to science education, or an evaluation of a new technology. The argument structure makes the term paper kinda like a miniature thesis, or a journal paper. If you write a few of these during a course work, you will be able to deal better with your research proposal and thesis.

3) Writing the paper should make you think. This is sort of implicit in the previous point, as you cannot develop an argument without thinking. However, in academic writing, particularly in humanities and social sciences, apart from the thinking you do to develop the argument, you also think *through writing*. This involves being able to see counter examples and counter arguments as you develop your argument in text, and then finding ways of countering them. This process can take a life of its own, and might lead you into many tangents that prevent you from developing your core thesis, so part of the skill here is learning how to do this in a controlled fashion.

4) Ideally, you should pick a topic that is related to a possible thesis topic you have in mind. This way, you can reuse the thinking you do for the term paper while developing your research proposal.

5) The paper should have an abstract (~150 words) that summarises its key points.

6)The term paper is due on 27th April midnight. This is a hard deadline, as I have to turn in the marks by end of April.

7) Two alternatives to term papers could be: 1)Doing an experiment, 2)Reveiwing a book. Texts based on these would also need to follow the above structure. Further, you need to discuss ideas for these with the instructor beforehand and develop a clear idea of what you will be doing.