Cognitive Science Q370, section 14911
Experiments and Models in Cognition
Fall 2015 Tu, Th 2:30-3:45, Room 228 Psychology Bldg.

Cognitive Science Q370, section 14912
Laboratory Section
Fall 2015 Wed 1:25-2:15, HPER 154

Course web site: http://www.indiana.edu/~pcl/rgoldsto/courses/q270.html
Canvas site: https://iu.instructure.com/courses/1479353
Laboratory web site:
http://www.indiana.edu/~pcl/

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Readings

There is no textbook for the class. The readings for each work can be found on the course web page above.

Breakdown of grade

SPSS assignment 1: 7%
SPSS assignment 2: 7%
SPSS assignment 3: 8%
Lab 1 Pattern recognition class project: 15%
Lab 2 Apparent motion experiment & computational simulation: 11%
Lab 3 Word perception computational simulation: 11%
Lab 4 Unconscious attitudes: 9%
Lab 5: Collective Behavior: 9%
Final project and talk: 23%

Course Structure

This course is designed to provide an intensive introduction to laboratory methods in cognitive science. The formal skills emphasized by this course are: experimental design, statistical analysis, computational modeling of human behavior, and scientific writing. The content areas covered in the course are: perception, pattern recognition, consciousness, concept learning, neural networks, and mathematical psychology. The course is grounded in a "learning by doing" philosophy. There will be very few general lectures. The majority of our time will be spent discussing research issues as they relate to particular experiments. You will learn about experimental control, statistical analysis, research writing, and analysis techniques, but you will learn about these topics while investigating real issues in cognitive science. Rather than try to give a broad overview of all of the major areas in cognitive science, I have chosen to select a few specific research areas that are within the mainstream of cognitive science. Although you will not get a general survey of cognitive science, you will acquire a depth of understanding about some areas.

Quite a bit of work is expected of students in this course. As you will see from the syllabus, there are many reading assignments, and many required written assignments. It is vital that you keep up with the class work (late assignments will be accepted, but you lose one half of a letter grade for every late day).

Policies

Labs. Your principle activity in this class will be to conduct experiments in cognitive psychology, to develop computational models to compare with human performance, and prepare written reports of the experiment and model outcomes. The goal of this class is to give you hands-on experience with what it is like to conduct and model actual experiments. Your labs will be evaluated on the following criteria:

completeness of introduction, thoroughness and accuracy of procedure and result sections, appropriateness of discussion, interest and creativity, grammaticality and style of report, and general coherency and comprehensibility. There will also be associated worksheets or assignments associated with the lab report.

Independent Final Project. The class will culminate in each students' preparation of an individual project. You will do background reading on a topic in cognitive science that is amenable to experimentation. You will design an experiment, conduct the experiment, analyze the results, and prepare a written report. The project should either involve experimenting on human subjects or the formal modeling of human behavior. The research question for the individual project must be approved by the professor. Creativity and originality are encouraged. Students are discouraged from pursuing cliche, non-original, or atheoretic projects (e.g. effects of music, or caffeine, on memory). The research should directly address theories in cognitive science. To get a feel for what mainstream cognitive science research involves, look through articles in the following journals: Cognitive Science, Journal of Experimental Psychology: Learning, Memory, & Cognition, Cognitive Psychology, Journal of Experimental Psychology: Human Perception and Performance, Memory & Cognition, Psychological Review, Journal of Memory and Language, and Psychonomic Bulletin and Review. The subjects for your independent study should be friends, or other students in the class. You can use the lab software for running your independent project, but you should not feel constrained by these labs. You do not have to use computers for running your subjects.

Talk on Independent Project. After the independent project has been completed, students will prepare a 15-minute presentation on their topic. Students should prepare overhead slides to describe their ideas, methods, results, and conclusion. In general, you should try to make your talk a genuine learning experience for your peers. Your talk should probably follow the same rough organization as your final written report.

Computer use. Research in cognitive science has been revolutionized by computer technology. Computers are now involved in every facet of research (running subjects, analyzing the results, displaying the results, and writing the article). You will need to learn how to use several programs: SPSS, Microsoft Word, and Generic Lab. Although we will spend some class time demonstrating these programs, it will also be necessary for you to spend time outside of class learning how to use these programs. You will have to modify experiments in order to create original studies or to address assigned questions.

Disclaimer. This syllabus is not definitive. Course policies are subject to change at any time. You will be notified of any changes.

Plagiarism and Cheating. According to the university's bylaws: "It is the responsibility of the student not only to abstain from cheating but, in addition, to avoid the appearance of cheating and to guard against making it possible for others to cheat." Cheating will be dealt with harshly.

Class schedule

Date	Topic	Assignments
Tu 8/25	Introduction, expectations, policies, overview	
We 8/26	LAB: Introduction to computer resources (IU Box, Labs, SPSS, PsycINFO, Web of Science)	
Th 8/27	Experimental Methods for Cognitive Science Mitchell, M., & Jolley, J. (1992). Research design explained. Fort Worth: Holt, Rinehart, and Winston. (pp. 15-32).	
Tu 9/1	Experimental Methods for Cognitive Science McBurney, D. H. (1994). Research Methods. Pacific Grove: Brooks/Cole. (pp. 141-167) http://www.indiana.edu/~statmath/stat/spss/mac/index.html	
We 9/2	LAB: Statistics I. Data input/output, summary tables, charting	
Th 9/3	Statistics - T-tests Myers, A. (1987). Experimental Psychology. Monterey, CA: Brooks/Cole. (pp. 242-293, Chapters 12 & 13). Read tutorial handout on SPSS	
Tu 9/8	Statistics - ANOVA and regression	

	Hayes, W. L. (1981). Statistics. New York: Holt, Rinehart, & Winston. (pp. 444-471, Chapter 13)	
We 9/9	LAB: Statistics 2. T-tests, ANOVA, regression	**SPSS assignment 1 due**
Th 9/10	Statistics –Factorial ANOVAs	
Tu 9/15	Statistics – Repeated measure ANOVAs	
We 9/16	LAB: Statistics 3. Repeated measures ANOVAs	**SPSS assignment 2 due**
Th 9/17	Lab 1: Pattern recognition (Outlining the problem) * Treisman, A. M., & Gelade, G. (1980). A feature-integration theory of attention. Cognitive Psychology, 12, 97-136.	
Tu 9/22	Lab 1: Feature search (Lab software and class project) Wang, Q., Cavanagh, P., & Green, M. (1994). Familiarity and pop-out in visual search. Perception & Psychophysics, 56, 495-500.	
We 9/23	LAB 1: Run yourself in whole class project	**SPSS assignment 3 due**
Th 9/24	Lab 1: Feature search (analysis, and variations)	
Tu 9/29	Writing up Experiments and More Methods McBurney, D. H. (1994). Research Methods. Pacific Grove: Brooks/Cole. [True experiments, Part 1: Single-factor methods] (pp. 444-471)	
We 10/30	LAB 1: Analysis of Feature search data	
Th 10/1	Lab 2: Apparent motion - psychological phenomena * Palmer, S. E. (1999)Vision science: From Photons to Phenomenology. Cambridge, MA: Bradford Books/MIT Press. (Chapter 10 – Motion Perception)	
Tu 10/6	Lab 2: Computational models of apparent motion * Dawson, M. R. (1991). The how and why of what went where in apparent motion: Modeling solutions to the motion correspondence problem. Psychological Review, 98, 569-603.	
We 10/7	LAB 2: Answer apparent motion worksheet Read Apparent Motion Lab description	**Lab 1 due**
Th 10/8	No Class (Fall Break)	
Tu 10/13	Lab 3: Word perception, and the word superiority effect and Using "Generic Psychology Laboratory" * Wheeler, D. D. (1970). Processes in word recognition. Cognitive Psychology, 1, 59-85.	
We 10/14	LAB 3: Word superiority effect, class project	**Lab 2 due**
Th 10/15	Lab 3: Computational models of word perception * McClelland, J. L., & Rumelhart, D. E. (1981). An interactive activation model of context effects in letter perception: Part I. An account of basic findings. Psychological Review, 88, 375-407.	
Tu 10/20	Lab 4: Conscious and unconscious processes *Jacoby, L. L., & Kelley, C. M. (1992). A process-dissociation framework for investigating unconscious influences: Freudian slips, projective tests, subliminal perception, and signal detection theory. Current Directions in Psychological Science, 1, 174-179.	
We 10/21	LAB 3: Interactive activation models	
Th 10/22	Lab 4: Conscious and unconscious processes	
Tu 10/27	Lab 4: Unconscious attitudes * Banks, W. B., & Farber, I. (2003). Consciousness. In A. F. Healy & R. W. Proctor (Eds.) Handbook of Psychology. New Jersey: John Wiley & Sons. (pp. 3-31).	
We 10/28	LAB 4: Implicit attitudes test Class project using Generic Psychology Laboratory	**Lab 3 due**

Th 10/29	Lab 5: Social Networks *Barabasi, A-L., Albert, R. (1999). Emergence of scaling in random networks. *Science,* 286, 509-512 *Watts D. J. and Strogatz S. H. Collective dynamics of 'small-world' networks. Nature 393, 440-442 (1998).	
Tu 11/3	Lab 5: Collective Behavior *Goldstone, R. L., Wisdom, T. N., Roberts, M. E., & Frey, S. (2013). Learning along with others. Psychology of Learning and Motivation, 58, 1-45. Goldstone, R. L., & Janssen, M. A. (2005). Computational models of collective behavior. Trends in Cognitive Science, 9, 424-430. Goldstone, R. L. & Gureckis, T. M. (2009). Collective behavior. Topics in Cognitive Science, 1, 412-438.	
We 11/4	LAB 5: Collective Behavior: coordination, competition, cooperation, and information diffusion	**Lab 4 due**
Th 11/5	Lab 5: Complex Systems Models * Netlogo Web User's Manual (http:// http://ccl.northwestern.edu/netlogo/)	
Tu 11/10	Lab 5: Computational Models of Social Behavior Macy, M. W., & Willer, R. (2002). From factors to actors: Computational sociology and agent-based modeling. *Annual Review of Sociology, 28*, 143-166.	
We 11/11	LAB 5: Netlogo Models of Collective Behavior	
Th 11/12	Lab 5: Collective Behavior	
Tu 11/17	Loose ends: Final project descriptions, statistics, models	
We 11/18	Final Project Development	
Th 11/19	No class (I'm out of town)	
Tu 11/23	Thanksgiving	
We 11/24	Thanksgiving	
Th 11/25	Thanksgiving	
Tu 12/1	Work on Final Project (office visits)	
We 12/2	Experiment Round Robin	**Lab 5 due**
Th 12/3	Presentations (meet in 228 Psychology)	
Tu 12/8	Presentations (meet in 228 Psychology)	
We 12/9	Presentations (meet in computer lab, HPER 154)	
Th 12/10	Presentations (meet in 228 Psychology)	
Tu 12/15	Presentations – 12:30-2:30 PM (meet in 228 Psychology)	**Final papers due December 15, 5:00**

Particularly important readings are indicated by asterisks.