05-775 A3 Cognitive Perspective in HCI

January 12 – Febuary 25, 2010

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Meetings: **T, TR- 10:30-11:50 AM - GHC 4301**

Office Hours: **My office in Porter Hall 223-C will be open any time on Tuesday and Thursday afternoons for any questions relating to the class.**

Units: **6 Units**

OVERVIEW

Once upon a time, computers were giant pieces of equipment (taking up to 680 square feet), built from many vacuum tubes, diodes, relays, resistors, and capacitors; weighing tons (literally ENIAC weighed 30 tons). There were no graphical user interfaces, no mice, and no windows. Input was possible through card readers and card punchers were used for output. Then, technology advancements, ideas, and developments gave birth to the personal computer; and from there, the field of human-computer interaction (HCI) became relevant in computer science.

In order to make human-computer interactions that are is easy to learn, easy to remember, and easy to apply to new problems, computer scientists must understand something about human learning, memory, and problem solving. Although these are topics normally taught in the psychology departments, there is a need to understand the particular aspects of human psychology that are relevant to computer scientists. A seminal source of both a useful theory of human performance and methods of analyzing HCI tasks is *The Psychology of Human-Computer Interaction* (Card, Moran, & Newell, 1983), from which many interesting applications have been derived.

In this course, we will learn the most up-to-date research in the Psychology of Human-Computer Interaction. The course is divided into themes of relevance for understanding the psychology of HCI. Each week we will discuss a major theme. I will also lecture on the structure of the course and the introduction to Human-Information Processing in the first class.

OBJECTIVES

When you complete this course, you will have a concrete understanding of the current research in the Psychology of Human-Computer Interaction. You will learn about the psychological research and how psychology is relevant to the design of effective hardware and software with which humans interact.

READINGS & REQUIREMENTS

This course is a seminar-style course, where each of you is responsible for reading all the papers assigned to each class and for participating in discussions. Selected articles are either classical to the field or very recent articles that showcase more current applications of psychological principles. Please be aware that the currently selected articles are not set in stone. These might change through the course

of the semester, and you are encouraged and welcomed to make suggestions. I will e-mail the papers to you at least two days before each class.

You may volunteer to be the lead discussant of a paper assigned to the class. If no one volunteers to be a lead discussant in a class, then one of you will be randomly assigned at the beginning of the class to lead the discussion of an article. The goal of the lead discussant is to introduce the paper selected for discussion and guide the discussion of the article with the rest of the class. This seminar is an interactive course where every participant is expected to have vigorous exchanges of ideas with all the participants. Every participant in this seminar is expected to read and critique each of the readings planned for the day.

In advance, before coming to the class, you are encouraged to prepare a critique for each article (see worksheet for critiques below), which could be used as your own guide to discuss the article. You are also responsible for bringing ONE question pertinent to each article which needs to be addressed during the discussion of that article. Please make sure that your questions are addressed in class.

Worksheet for critiques of articles

Reading original articles helps us learn first-hand how research ideas are formulated, tested, analyzed, and interpreted. In analyzing each research article, try to answer the following questions:

1. What was the main research question?
2. What methods were used to study this question and why?
3. Was the study an experiment (involving manipulated variables) or a correlational study (involving only measured variables)?
4. What was the outcome of interest (dependent variable) and how was it measured?
5. What data were collected?
6. What were the primary findings?
7. What interpretations were made of the findings?
8. How did researchers deal with quality control issues (ethics, validity, reliability, and so forth)?
9. What research would usefully clarify or extend the present findings?

Essays

In addition, **every Tuesday** before the class starts (before 10:30AM), you must submit an essay that summarizes the theme of discussion of the previous week, and the implications and applications of these theme to the design of interactive systems and HCI. The essay should present your critical thinking on the readings and the Psychology theme of the previous week, as well as the implications to HCI. Your goal is to write down your own thesis (a declaration of your belief) and defend your opinion through the reading of original articles you have analyzed and critiqued in the previous week. You are also encouraged to discuss and include articles you found relevant to the theme of discussion, even if they are not on the reading list.

Please limit your essay to 2 to 3 pages single-spaced with 1" margins. A main portion of your essay will consist of arguments to support and defend your belief, and another main portion of your essay should include the implications and applications of the Psychology theme to HCI. Feel free to organize your essay with subtitles as it applies to your thinking. All points must relate to the major topic of the class corresponding to the week previous to your essay.

Please **Email you essay** before the deadline to: coty@cmu.edu. Please use a subject in the message that starts with "05775" and identifies the theme that the essay refers to.

The **last essay is due on March 2nd**, but there is no class on March 2nd. The last class is on February 25.

GRADING

Grades for 05-775 will be computed as follows:

30% - Quality of your leading discussion of readings in class. Because the assignment of the leader is first voluntary, and second by assignment if no one volunteers, if you are assigned to lead the discussion of an article and you are not present in class, you will automatically loose 5% of your final grade.

10% - Quality of your participation in discussing the readings in class that you don't lead. This implies that you will need to attend all the classes in order to participate in class discussions. If you know you will be absent in a class date, please discuss this with me during the first week of the course.

60% - Quality of your essays regarding the theme of the week. Each essay is worth 10%, note there are 7 weeks in the course. This means that you may: turn in only 6 essays or turn in all 7 and drop the lowest grade essay (your choice).

Quality grading will be directly based on my experience in this field and my experience with judging the writing and thinking of graduate students in general. You will receive written or oral **feedback** from me regarding each essay within one week of the deadline of your essay.

There are **no exams** in this class.

SCHEDULE

Date	**Topic & Readings**

Introduction to HIP and the Psychology of HCI.

I will introduce the course, syllabus, policies, etc. Then, I will present a brief introduction to the Human Information Processing (HIP) system and different related research questions addressed in HCI and the need for the HIP information. This week will serve as an introduction to the HIP system. Discussion of articles will start on January 14th.

Jan 12	
Jan 14	Card, Moran & Newell, 1983, chapter 2 Olson & Olson, 1990 Proctor & Vu, 2006

The Perceptual System

We will cover principles from Perception in Psychology relevant to the design of interactive software. We will attempt an understanding of how to use human perception principles to design guidelines and make design choices.

Jan 19	Jacob, 1991 Turk & Robertson, 2000
Jan 21	Brewster, 2002 Oviat et al., 2003

The Cognitive System: Attention and memory

We will cover issues of attention and memory in Psychology that are relevant to the design of interactive systems.

Jan 26	Pashler, 1999, chapter 1
	Horvitz, Kadie, Paek, & Hovel, 2003
Jan 28	McFarlane & Latorella, 2002
	Roediger and McDermott, 2000

The Cognitive Systems: Learning, problem solving, and decision making

We will introduce higher level cognition concepts in Psychology: learning, problem solving, and decision making. We will discuss how these themes and knowledge from Psychology shapes the way we can design interactive systems.

February 2	Endsley, 1995
	Vicente & Pereklita, 1995
February 4	Gonzalez, 1996
	Mackay, Barr, & Kletke, 1992

The Motor System

We will discuss innovative ways of motor interaction, the considerations of the motor system that need to be accounted for when designing interactive systems.

February 9	McKenzie, 1992
	Wu & Balakishnan, 2003
February 11	Oviatt et al., 2000
	Jaimes & Sebe, 2007

Cognitive Modeling

We will discuss the interesting attempts since Card, Moran, and Newell, and before, to represent the human information processing computationally.

February 16	Gray & Altman, 2001
	Meyer & Kieras, 1999
February 18	Byrne, 2005
	John, Prevas, Salvucci, & Koedinger, 2004

Social Cognition

Psychology involves individuals, but also societies and organizations. This week we will discuss Social Cognition, to open the door to a new set of concepts beyond the individual that are relevant in designing interactive systems. A faculty member in HCII who specializes in social cognition will give a talk in our last class.

February 23	Mantovani, 1996
	Corritore, Kracher, & Widenbeck, 2003
February 25	Guest Lecturer: Niki Kittur.