Applying Cognitive Science to problems in the real and virtual–worlds

01:185: TBA

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Summer 2014 – Session TBA – NB
eCompanion/eCollege
Location: ARC: TBA

Course Description:

This course surveys the field of Cognitive Science and examines: (a) How research findings have informed our understanding of human cognition, and (b) Applications to real– and virtual–world problems. We will study the role of essential processes from neurobiology, perception, and attention, and how these are used when we search, select and remember information, and when we reason and make decisions. We will learn about cognitive shortcuts that help simplify problems, but cost us in biased and erroneous reasoning. Finally, we will consider how our understanding of human cognition can help us overcome cognitive limits and improve problem solving in real–world and virtual (online) activities.

Course Content: Online in eCollege:
https://onlinelearning.rutgers.edu/ecollege–student–login
**Additional journal & online articles:** TBA

**Topics:** (Schedule & detailed content posted in eCollege)

1. Research for understanding and predicting behavior
   - Studying Behavior: Response time vs. Accuracy
   - Experiments vs. Anecdotes

2. Localized vs. distributed representation
   - Applications:
     - Human–Computer Interfaces (HCI)
     - Eye–movement controlled HCI
     - Thought controlled HCI (via brain activity)

   - Expectations & Context
   - Assumptions & Unconscious inference
   - Applications:
     - Real vs. Virtual interactions
     - HCI & the human factor: User Experience Research
     - Web–based interactions & Web Usability
     - Predict and improve online designs
     - Usability goal: Minimizing interaction costs

4. Overt vs. Covert Attention.
   - Automatic vs. Controlled behaviors.
   - Search & Selecting information
   - Priming & Expectations
   - Cognitive Load and Divided Attention
   - Applications:
     - Distracted driving, cell phones & texting
     - Web Design & finding info online

5. Encoding, Retrieval & Memory Errors
   - Recognition vs. Recall
• Constructive nature of memory
• Applications:
  o Improving memory (e.g., chunking, imagery)
  o False memories & Eyewitness testimony

6. Knowledge & Reasoning    Chapter 9
• Concepts & Categorization
• Deductive & Inductive reasoning
• Heuristics & Cognitive Bias
• Schemas and scripts
• Application: Online games, Game theory & virtual interactions

7. Visual Imagery & Propositional thought    Chapter 10
a. Mental models & mental representation

8. Language & Communication Chapter 11
• Factors that influence reading and comprehension
• Reading patterns: online vs. in the real-world.
• Word and sentence processing; Skimming vs. Reading

9. Problem Solving, Reasoning and Decision Making    Chapters 12 & 13
• Deductive vs. Inductive Reasoning
• Framing & Anchoring
• Heuristics & Cognitive Shortcuts.
• Disregarding baseline information.
• Applications:
  o Persuasion, Framing & Confirmation Bias
  o Judgments & Justification: Making Decisions with
Requirements & Evaluation:
All students are required to do each of the following:

1. Participate in online discussions and research demos
2. Complete brief assignments
3. Paper 1 Topics TBA (3–4 pages)
4. Paper 2 Topics TBA (5–7 pages)
5. Complete three exams.

Grade breakdown:
- 20% -- Exam 1
- 10% -- Paper 1
- 20% -- Exam 2
- 15% -- Paper 2
- 20% -- Exam 3
- 15% -- Participation & Brief assignments

Letter Grades
- A 90 – 100%
- B 80 – 89
- C 70 – 79
- D 60 – 69
- F < 60

Due Dates
Exams and assignments must be completed on the dates announced in class and online. Only medical excuses or very serious personal problems will be accepted as reasons for missing an exam.

Statement of academic integrity
In this course you are expected to perform to the utmost of your ability in an honest and sincere manner. Cheating, plagiarism, the use of unauthorized materials or any other form of academic misconduct will result in a severe penalty in accordance with Rutgers University's policy on academic integrity (Section 2c)

What is plagiarism?
Plagiarism is a serious ethical issue with serious academic consequences. Often students commit subtle, and not so subtle, forms of plagiarism. Often plagiarism is inadvertent and done without a student even being aware that he or she is committing a major academic violation that can result in expulsion from the University. Therefore, I have made available various resources (here and in eCollege) to help educate you on what plagiarism is, how to be aware of accidental plagiarism, and how to avoid plagiarism.