

Psychology 412/712
Cognitive Modeling
10:30am-11:50am - T/R
BH 340A

Instructors: John R. Anderson (ja@cmu.edu), Dan Bothell (db30@andrew.cmu.edu)

Books, etc:

Anderson: How can the human mind occur in the physical universe?

Graham: ANSI Common LISP

There is also an ACT-R Tutorial that can be downloaded.

The goal of this course is to teach cognitive modeling techniques. These techniques have a number of applications including

1. Understanding human cognition
2. Design of systems that will interact with humans
3. Development of intelligent tutoring systems
4. Design of cognitively plausible agents to occupy synthetic or real environments
5. Organization of data on brain function

The course will have a focus on these topics as they apply to learning, particularly in educational settings but we will consider a wider range of applications. Students may choose to perform any final project that involves cognitive modeling.

The first two-thirds of the course will involve reading about the ACT-R cognitive architecture, other papers of cognitive architectures, and will involve a series of 6 small projects involving ACT-R. There will be a 24 hour take home exam on this material. The last third of the class will be focused on a project of your choosing.

After finishing this part of the course you should be able to:

- Describe the key issues involved in the design of cognitive architectures
- Utilize the cognitive architecture, ACT-R, to model a variety of human cognitive processes
- Understand more generally how computational modeling techniques can be brought to bear on learning tasks.
- Understand issues in learning to become proficient at mathematical problem solving

You will do a project of your choice that will involve practice in

- Delivering an effective oral presentation
- Writing an effective project report
- Constructively critiquing peers' projects

Tentative Schedule

January

Tues, Jan 17: Class Organization & Introduction

Thurs, Jan 19: Introduction to ACT-R

Unit1 (5 points): Understanding Production Systems (due 11 PM, Mon, Jan 23)

Tues, Jan 24: ACT-R: The Perceptual Motor Interface

Thurs, Jan 26: Discuss Chapter 1&2 from Anderson 2007

Tues, Jan 31: Discuss Chapter 3 from Anderson 2007

Unit2&3 (10 points): Subitizing (due 11 PM, Wed, Feb 1)

February

Thurs, Feb 2: ACT-R: Base-Level Learning

Tues, Feb 7: Paper on Cognitive Architectures

Thurs Feb 9: Discuss Chapter 4 from Anderson 2007

Unit4 (10points): Zbrodoff model (due 11 PM, Mon, Feb 13)

Tues Feb 14: Utility Learning & mini-project description

Thurs, Feb 16: Discuss Chapter 5&6 from Anderson 2007

Mini Project Part 1 (X points) (due 11 PM, Mon, Feb 20)

Tues, Feb 21: TBA

Thurs Feb 23: TBA

Mini Project Part 2 (Y points) (due 11 PM, Mon, Feb 27)

Tues, Feb 28: ACT-R: Spreading Activation and Partial Matching

March

Thurs Mar 2: TBA

Tues Mar 4: TBA

Unit5 (10 points): One-hit blackjack (due 11 PM, Wed, Mar 8)

Thurs Mar 9: TBA

Tues & Thur Mar 14&16: Spring Break

Tues, Mar 21 ACT-R: Production Compilation

Thurs, Mar 13: TBA

Tues, Mar 28: TBA

Unit6&7 (10 points): Past Tense Model (due 11 PM, Wed, Mar 29)

Thurs, Mar 30 TBA

April

Tues, Apr 4: TBA

Thurs, Apr 6: TBA

Tues, Apr 11: TBA

Tues, Apr 13: TBA

April 14-19: 24 hour take-home exam (25 points)

Thurs, Apr 20: Spring Carnival

Tues Apr 24 – May 4: Final Project Reports

Grading

Units:	45 points		
Mini-Project:	15 points	A:	> 120 for undergraduates
Final Project:	50 points		> 130 for graduates
Class Participation:	15 points	B:	> 100 for undergraduates
24 hr Take-Home Exam:	25 points		> 110 for graduates
Total:	150 points	C:	> 80 for undergraduates