

Syllabus for 830: 472 Cognition and Computation Fall, 2005

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Text: Pratt, Ian *Artificial Intelligence*. London: Macmillan Press, 1994.
Place: Room 203, ARC, Busch Campus
Time: Monday & Thursday 2nd Period (10:20 - 11:40 A.M.)
Instructor: Prof. Charles Schmidt
Office: Room 135A, Psychology Bldg, Busch Campus
Phone: 732 445-2874
Email: cfs@rci.rutgers.edu
Course URL: <http://www-rci.rutgers.edu/~cfs>
Office Hours: Monday, 12:00 - 1:00 PM or by appointment

Course Outline

Part I: Basic Ideas

I.1. Introduction to Computation & Cognition

Some Historical Background
Chess: Person versus Machine
Defining, Designing and Studying Intelligent Machines
Levels Hypothesis

Chapter 1. What is Artificial Intelligence?
Chess Match Articles

Reading:

- Mean Chess-Playing Computer Tears at Meaning of Thought, By Bruce Weber, February 19, 1996
- Conventional Wisdom Says Machines Cannot Think By George Johnson, May 9, 1997
- IBM Chess Machine Beats Humanity's Champ By Bruce Weber, May 12, 1997
- Computer in the News: Kasparov's Inscrutable Conqueror By Robert D. McFadden, May 12, 1997

Minsky, M. L. Why People Think Computers Can't. *AI Magazine*, 1982, 4, 3-15
Skim Appendix (Introduction to Logic)
Website

Quiz

I.2. Formal Models of Computation

The Intuitive Idea -- Stating and Following Rules

Church-Turing Thesis

Chomsky/Machine Hierarchy

Some Results

Reading: Website

Quiz

I.3. Artificial Intelligence and the Design of Intelligent Systems

A Little Bit of Logic to get us going

Physical Symbol System Hypothesis

Representation and Semantics

General Models of Search

Knowledge & Search

Computational Limits and Rationality

Review [Appendix](#) (Introduction to Logic)

Reading: [Chapter 2. Search and Planning.](#)

Website

EXAM 1 covering Lecture and Readings of Part I.1-3.

I.4. Human Cognition as Computation

Cognitive (Functional) Architecture

Requirements

Production System Architecture

Problem Spaces

Protocol Analyses

Reading: Website

Quiz

Part II. Research Topics: The Computational Approach Exemplified

II.1. Problem-Solving and Learning

Induction vs. "Biased" Learning

Simple "Concepts"

Tower of Hanoi Examples

Baseball

Exploratory Learning

Reading: [Chapter 9. Induction.](#)

Website

Quiz

II.3. Planning

Problem Reduction Approach to Planning

Linear and Non-linear Planning

Plan Execution and Plan Monitoring

Learning in the Context of Planning

Reading: [Chapter 2. Search and Planning. \(Review\)](#)
Website

Quiz

II.4. Knowledge Representation, Commonsense Knowledge, and Inference

Epistemological Adequacy and Heuristic Adequacy

Logic and Commonsense Knowledge

Models of "Semantics"

The Problem of Non-monotonicity

Frames, etc.

[Chapter 3. Logic and Inference](#)

Skim [Chapter 4. Closed World Assumptions](#)

[Chapter 5. Defeasible Inference](#)

Reading: [Chapter 6. Reason Maintenance](#)

[Chapter 7. Memory Organization](#)

[Chapter 8. Probabilistic Inference](#)

All in Pratt, Ian *Artificial Intelligence*. London: Macmillan Press, 1994.

Website

EXAM II (Final - Dec 21 8-11 PM) focusing on Lecture and Readings of I.4 and II. 1-4

Homework, Grading, Etc.

Part I of the course is designed to provide an overview of the general ideas and Part II looks at specific areas of research in more detail. The reading for the course will consist of the assignments from the text, handouts or articles posted on the website and the materials on the website specifically developed for this course. Part of the purpose of developing and posting materials on the website is to:

- give you the chance to look over the material to be covered in class ahead of time so that you might have more of an opportunity to pose questions and make observations in class;
- to minimize the need for you to take notes in class; and
- to minimize the necessity of presenting and explaining every detail in lecture.

You will notice that we will rely heavily on the use of examples to present the major ideas in the field. There are two reasons for this. At times the ideas are well worked out in the field and could be presented in a completely general way. However, without the technical background this is often a painful and difficult way to first come to grips with the ideas. At other times, the ideas have not been completely worked out and examples must play a major role in the presentation of the ideas. Where examples are presented it is generally advised that you attempt to fully understand these examples.

If at all possible, I suggest that you at least skim the material on the website prior to the class in which the material will be presented. If there are aspects that you do not understand but you are reluctant to ask about it in class, then you might want to let me know about this via Email (cfs@rci.rutgers.edu) prior to the class in which the material will be presented. I will make it a point to read this directory prior to class.

(You may also turn your homework assignments in as an attachment to an email to this account.)

Extra Credit

If you wish to do an extra credit project for the course, then this project should be approved no later than the first week in April and turned in to the instructor no later than the last day of class. Some possible extra credit projects include:

- creating content related to the course that could potentially be included in the course website. This might involve creating examples or experiments related to the course material, extending either the depth with which a topic is covered, or adding additional related topics.
- creating additional tools for use of the website.
- participating in some research on problem solving. In this case, you would analyze and discuss your own data in relation to various ideas about human problem solving.
- ...

Course Grade

Your course grade will be determined by your performance on the quizzes, homework assignments, exams and to the degree that I can evaluate it, your class participation and performance. Quizzes will be short and consist of true/false and/or multiple choice questions. Exams will also consist of true/false and/or multiple choice and short answer questions and will include problems to be solved. The homework assignments will be evaluated as either good, satisfactory or unsatisfactory. Assignments handed in after their review in class will be evaluated as satisfactory or unsatisfactory. Any extra credit work will also be considered when assigning the final course grade.

Printing the pages on this site

If for some reason you decide that you wish to print one or more of these pages then be sure that the print setup is in **Landscape** mode. Note, however, that these HTML pages have not been constrained to have any particular vertical limit. Consequently, a page may print on to several pages and the page breaks may occur at arbitrary points. If at all possible, I recommend making every effort to use these pages on line rather than printing since they were developed under the assumption that this would be the primary mode of use. Using them on line will allow you to view the animations, JavaScript related features as well as view the most recent updates of the pages.

Click here to access a [Bibliography](#) of other texts and books that may be useful to you.

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