COMPUTER SCIENCE 431

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

I. Introduction

A. Catalog Description

This course introduces the student to the techniques of artificial intelligence using LISP or Prolog. The student is introduced to the basic techniques of uninformed and informed (heuristic) search, alpha-beta pruning in game trees, production systems, expert systems, neural networks, and to techniques of knowledge representation and problem-solving. Additional topics may include computer models of mathematical reasoning, natural language understanding, machine learning, and philosophical implications. *Prerequisite: CSCI 361 (may be taken concurrently) or permission of instructor.* Offered every other Fall; offered Fall 2006.

B. Prerequisites

Computer Science 361. Experience with the propositional and predicate logics is a necessary prerequisite for this course. A grade of C- is required in prerequisite courses.

C. Evaluation

Students will be evaluated on the basis of homework, exams (including a comprehensive final), and class participation.

II. Learning Objectives:

A. Language basics

Students will gain programming experience in the language to be used in the course (LISP or Prolog or both).

B. Searching

Students will learn the techniques of uninformed search (depth first and breadth first), the use of heuristics, and the techniques of informed search including the use of the A* algorithm.

C. Knowledge Representation

Students will learn how to represent and manipulate knowledge using isa-hierarchies, semantic networks, database systems, production systems, and predicate logic.

D. Problem solving.

Students will learn the basics of expert problem solving with an emphasis on condition-action expert systems, including:

1. Production-based Expert systems
2. Decision making under uncertainty - inference networks
3. Case Based Reasoning
4. Qualitative Reasoning

E. Students will learn the basics of the connectionist model for computation (Neural Networks) through work with

1. Perceptrons and the perceptron learning theorem
2. Multilayer feed-forward neural networks and backpropagation.

III. Additional topics

In addition to the "core" topics listed above, the course may include several of the following topics, depending on the interest of the instructor(s) and the class:

A. Mechanical Theorem Proving

B. Game playing.

C. Natural Language Understanding

D. Computer Vision.

E. Machine Learning.

F. Other Computational Models Inspired by Biology: Genetic Algorithms

G. Robotics

IV. Bibliography

Peter Norvig Paradigms of Artificial Intelligence Programming: Case Studies in Common Lisp

Russell & Norvig Artificial Intelligence: A Modern Approach

Tom M. Mitchell Machine Learning