CS4881 Syllabus – Winter 2011-2012

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Milwaukee School of Engineering
CS-4881 Artificial Intelligence

Description

The objective of this course is to introduce the basic concepts of artificially intelligent systems. Topics covered include knowledge representation, search strategies and machine learning. Modern machine learning techniques for supervised, unsupervised, and reinforcement learning are introduced. The role of AI in engineering and computing systems is presented, and students complete exercises that allow them to apply AI tools and languages to suitable problems.

Prerequisites

- CE-1900 or EE-290 or EE-2901
- CS-2851

Required Materials

- *Artificial Intelligence A Modern Approach 3rd ed.* Stuart Russel and Peter Norvig, Prentice Hall
- *Notebook computer required*

Course Outcomes

Upon successful completion of this course, the student will:

- Demonstrate an understanding of the principles of Formal Logic, Proposition Calculus, and Predicate Calculus.
- Conduct proofs of correctness in reasoning systems using the methods of Unification and Resolution.
- Understand the techniques involved with reasoning in the presence of uncertainty.
- Address the problems related to search, and its application to intelligent systems, including: game playing, decision making, and adversarial search.
- Understand and apply modern machine learning techniques for supervised, unsupervised, and reinforcement learning.

Course Topics

- Problem Solving, Uninformed Search
- A* Search and Heuristic Functions
- Local Search
- Constraint Satisfaction
- Online Search
- Game Playing
- Logical Agents, Propositional Logic

	• Forward Chaining, Backward Chaining, Knowledge Agents • More Knowledge Based Agents • First Order Logic • First Order Inference • Knowledge Representation • Acting under uncertainty, axioms of probability, inference using joint distributions • Bayes Networks • Machine Learning • Learning from observations – Supervised Learning • Naive Bayes • Knowledge in Learning • Unsupervised Learning – Clustering • Reinforcement Learning • Concept Learning and Inductive Hypothesis
Prerequisites by topic	• A fundamental understanding of structured programming languages • A fundamental understanding of data structures and algorithms • A fundamental understanding of probability and statistics

Grading

Problem Sets/Labs (~ 4) 50%

Midterm 20%

Final 30%

Policies

Late assignment policy: Assignments are due on their "due date." Late assignments will be accepted (or not) at the discretion of instructor. Letting me know in advance is likely to receive kind treatment of late assignments. If late assignments are accepted, they will most likely incur a penalty.

Please consult the MSOE policy on academic integrity. I take this seriously and reserve the right to run plagiarism software on any submitted assignment. In brief it states the following:

The expectations of the university with respect to academic and classroom integrity are reflected in, but not limited to, the following guidelines:

1. *The student must recognize that even a poorly developed piece of work that represents his or her best efforts is far more worthwhile than the most outstanding piece of work taken from someone else.*
2. *Assignments prepared outside of class must include appropriate documentation of all borrowed ideas and expressions. The absence of such documentation constitutes "plagiarism," which is the knowing or negligent use of the ideas, expressions or work of another with intent to pass such materials off as one's own.*
3. *The student should consistently prepare for examinations so as to reduce temptation toward dishonesty.*
4. *A student may not share examination answers with others for the purpose of cheating, nor should he or she, through carelessness, give them an opportunity to obtain them.*
5. *The student should know that a person of integrity will not support, encourage or protect others who are involved in academic dishonesty in any way, and will furthermore attempt to dissuade another student from engaging in dishonest acts.*

The full policy can be found here:
http://www.msoe.edu/life_at_msoe/current_student_resources/academic_resources/registrar/policies/policy_on_student_integrity.shtml

The course covers and is organized around three major areas:

- Search (3 weeks)
  - Graph Search
  - Constraint Satisfaction
  - Games

- Knowledge Representation and Inference (2-3 weeks)
  - Propositional and First Order Logic
  - Rule-based Systems, Fuzzy Logic
  - Inference

- Machine Learning (4-5 weeks)
  - Bayes Networks
  - Naïve Bayes
  - Decision Trees
  - Neural Networks
  - Reinforcement Learning
  - Online Learning
  - Web Data Mining

Topics may vary based on student interest and current trends in applications and research.

Please consult the course outline for daily topics, materials, reading assignments, lab assignments, and schedule.

Assignments

All programming assignments require a demonstration.

All assignments require a report.

- Reports should be submitted in PDF format. Multiple file assignments (programming) should be submitted as a Zip file. The report ***must*** be included within the Zip file. The name of the zip file and the name of the report must include the class number "CS4881", section number, lab number, and *your* email name.

Guidelines for Success

Completing lab assignments is vital to success in the course. Programming assignments reinforce topics covered in class and prepare students for exams.

Quizzes will be announced at least 1-day in advance and may or may not be graded. The goal here is to test knowledge of concepts for lab work and prior to exams.

Late assignments will be accepted only at my discretion, and if accepted, may incur a deduction. If for whatever reason, you can not complete your lab assignment in time, you should contact me in **advance**.

It is your responsibility to be present for all exams. Please contact me **in advance** if you have a valid conflict with a scheduled exam. Final exams will be comprehensive.

You are responsible for assignments and announcements made in class or lab. In addition, you should periodically check your email account.

Academic integrity is expected. Sharing ideas and asking questions is strongly encouraged, however cheating on an exam, or submitting programming assignments that were not your own work will result in a grade of zero.

If you have any special needs, it is your responsibility to let me no.

Use of laptops during lecture is *not* allowed. Please be attentive and courteous.

Class participation is a significant portion of performing well in lass. Keep up with readings, assignments, research and industry trends, and class discussions. Please contribute – you'll help make this a great class.

I am interested in your feedback on how I can make this course better. Feel free to stop by my office, send me email, or drop an anonymous note in my department mailbox with suggestions on how I can make this a better class for you. Please don't wait until evaluation time because I won't see those comments until the quarter is over and you are done with the course!

Good Luck,

Jay Urbain