Course Syllabus – CSC 412 – Introduction to Artificial Intelligence

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Office: TEC 201
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Meetings: 3:30-4:45, Mondays & Wednesdays, in TEC 202
Office Hours: 1:00-2:00 (MW) + 2:30-4:00 (TTh) + by appointment

Status within the Curriculum
Elective

2009-2010 Catalog Description
Introduction to concepts and techniques employed in intelligent systems

Course Prerequisite(s)
1. CSC 307 (Data Structures and Algorithm Analysis): Required
2. CSC 300 (Discrete Mathematics, or equivalent): Preferred

Textbook(s) and/or Other Required Material
Artificial Intelligence: A Modern Approach, (3rd ed.) by S. Russell and P. Norvig,
Additional course materials may be posted on the class website (URL is case-sensitive):
http://www.cs.usm.edu/~banerjee/CSC412
Various notifications and assignments will also be posted on this webpage, so be sure to check this URL often.

Attendance
You should do your best to attend every class. Knowledge presented in class will be critical for passing the midterm and the final. In addition, pop quizzes (at the very beginning of a class) based on the week’s readings are always a possibility. If you are late for a class, you may miss a quiz, unless prior arrangements are made with the instructor.

Email policy
If you send me any email, you must include your full name in the email, and mention “CSC 412/632” on the subject line. I may not respond to your email if you fail to do so.

Workload
There will be a few homeworks and 3 main projects, in addition to a midterm, a final, and possibly pop quizzes. The workload will be targeted to roughly 6 to 8 hours per week (on the average) outside of class.

Grading
25% Homeworks/Quizzes
30% Projects
20% Midterm
25% Final
Late homeworks/projects will be penalized by 20% per calendar day, except for extreme circumstances. If possible, give the instructor advance notice of any problems. In order to get a good distribution of grades, it might be necessary to apply a scale or curve.

**Special accommodations**
A student with a disability that qualifies under the American with Disabilities Act (ADA) should contact the Office for Disability Accommodations (ODA). Address:

*Office of Disability Accommodations*
118 College Drive #8586
Hattiesburg, MS 39406-0001
*Phone: (601) 266-5024, Fax: (601) 266-6035*

Individuals with hearing impairments can contact ODA using the Mississippi Relay Service at 1-800-582-2233 (TTY), or email Suzy Hebert at Suzanne.Hebert@usm.edu

**Academic honesty**
Students are encouraged to collaborate in preparing for tests/quizzes, and even for homeworks/assignments. However, the final work submitted must be the student’s own work. No collaboration will be allowed during quizzes/tests. Any form of academic dishonesty will not be tolerated and will draw severe penalties. See the USM Undergraduate Bulletin for the possible penalties.

**Course Schedule (tentative)**

| 1. | 3 Hours – Foundations of AI | History of AI, perspectives – philosophical, mathematical, psychological, etc., thinking vs. acting, humanly vs. rationally, knowledge of the Turing test and “Chinese Room”.
| 2. | 3 Hours – Intelligent Agents | Agents and environments, rationality, PEAS, environment and agent types
| 3. | 8 Hours – Search and constraint satisfaction | Formulation of problem spaces, knowledge of brute-force search methods (breadth-first, depth-first, iterative deepening), informed search methods (best first, A*), heuristics and admissibility, formulation and solution of constraint satisfaction problems, experience with adversarial search (minimax and alpha-beta pruning)
| 4. | 3 Hours – Advanced search | Knowledge and experience with genetic algorithms, simulated annealing, local search
| 5. | 8 Hours – Knowledge representation and reasoning | Logical agents, propositional and first order logic, inference in first order logic (forward and backward chaining, resolution, theorem proving)
| 6. | 8 Hours – Reasoning under uncertainty | Probabilistic reasoning, understanding of Bayesian networks and complexity of inference, temporal reasoning (smoothing, filtering and prediction)
| 7. | 6 Hours – Planning | Definition and examples of planning systems, formulation of planning as search, understanding of forward and backward search, knowledge of partial order planning
| 8. | 3 Hours – Learning with Neural Networks | Structure and representational power, perceptrons and multi-layer networks, backpropagation
| 9. | 3 Hours – Presentation | Students will present their group project
Projects (Spring 2010)

1. (Individual, 10%) Implementation of minimax search and alpha-beta pruning in the general game framework (Java basecode will be provided)

2. (Team, 10% project +10% presentation) Implementation and presentation of the solution of an interesting AI problem (no basecode will be provided). Note: this project may need group research of methodologies not covered in class, and will require a group presentation that will be scheduled around the last week of classes. Topics may be selected from (but not limited to) the following:
   a. Solution of a puzzle, such as the $n$-puzzle, or the $n$-Queens problem, from any starting state (NOT FOR GRADUATE STUDENTS)
   b. Implementation of a theorem prover with first order logic
   c. Implementation of an approximate inference technique for Bayesian networks
   d. Implementation of the particle filtering algorithm for robot-localization on a given map
   e. Implementation of GRAPHPLAN or SATPLAN for STRIPS problems

CSC 632: Artificial Intelligence (graduate section)

In addition to the undergraduate work-load, the graduate students must

1. Team only with undergraduate students for the group project (not with other graduate student(s)). If you are unable to form a team with undergraduate student(s), then I will try to assign you to a team. Only if that does not work out, you will be allowed to work alone. In that case, the grade breakup of your group project will be as above.

2. Choose a non-trivial project topic (for instance, $n$-Queens or $n$-puzzle will not do, but 2b-e are acceptable). I will determine if the topic you have chosen is sufficient, based on your proposal.

3. Mentor the undergraduate group mates in solving the selected project problem. This includes mentoring in research as well as with coding. Out of the 20% in final project, 15% will be determined based on your group-mates’ feedback on how helpful and available you were and how much they learned from you. The remaining 5% will depend on your (co-)presentation. To discourage disruption of your group-mates’ work, any graduate student who drops this class after the Mar-03-10 deadline will receive an ‘F’ grade.

4. In addition to working with undergraduates in the group project, you may elect to help one or more undergraduate student(s) who have no prior experience with JAVA to learn JAVA for the first project. This will be counted for extra credits.