INSY 6392 – Agent-based Information Systems
Spring 2016

Syllabus

Instructor:
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Brief Description:
This doctoral-level course will cover the foundations of Artificial Intelligence (AI) and heuristic search and learning techniques We will cover some of the important problem-solving tools & techniques from AI including search strategies, expert systems, machine learning, data mining and move onto the more advanced topics involving agents. We will also be interested in agent-based modeling of contexts of strategic interaction (CSI) (like prisoner's dilemma). Consequently, we shall learn effective agent learning techniques, including evolutionary methods and reinforcement learning. We will also be using a fair amount of mathematics. Familiarity with linear algebra and mathematical notations will be helpful.

Students will be required to present 2 groups of research papers (from the list provided) in class. The paper presentations will be held during the second half of each class from 2/3 – 4/6. Students are also required to do a research project on an approved topic of their choice. Details about the project and presentations are provided in a separate handout.

Important Dates:
Paper presentations: 2/3- 4/6
Project topic due (by email): 3/1
Project presentations: 4/13 – 4/20
Exam: 4/27
Final project report due: 5/11

Grading Structure:
35% Term project & presentation
35% Paper presentations
30% Final exam

(Incomplete) Suggested Reading List (Books):

Axelrod, R. *The Evolution of Cooperation*, Basic Books, 1984.

Goldberg, D. *Genetic Algorithms in Search, Optimization & Machine Learning*, Addison Wesley, 1989.

Michalewicz, Z. and D. B. Fogel, *How to Solve It: Modern Heuristics*. 2nd Ed., Spinger, 2004

Osman, I.H. and Kelly, J.P. (Eds). *Meta-Heuristics: Theory and Applications*, Kluwer Academic Publishers, 1996.

Russel, S. and Norvig, P. *Artificial Intelligence: A Modern Approach*, Prentice Hall, 2003.

Simon, H. A. *The Sciences of the Artificial*, 3rd Edition, MIT Press, 1996.

Sutton, R.S. and Barto, A.G. *Reinforcement Learning: An Introduction*, MIT Press, 1998.

Wooldridge, M. *Introduction to MultiAgent Systems*, John Wiley & Sons, 2002.

Tentative List of Topics:

- Introduction to AI
- Search Strategies (breadth first, depth first, best first, A*, hill-climbing etc.)
- Optimization Heuristics (simulated annealing, tabu search, etc.)
- Expert Systems (rule-based knowledge representation, inference mechanisms, etc.)
- Inductive/Machine Learning and Data Mining (decision trees, neural networks, genetic algorithms, etc.)
- Agent-Based and Multi-Agent Systems
- Agent-Based Modeling (game theory, prisoner's dilemma, reinforcement learning, evolutionary computation, etc.)

Student Learning Outcomes

1. The student will explain different search techniques (for e.g., breadth first, depth first, best first, etc.) and apply them to solve problems.
2. The student will explain different machine learning techniques (for e.g., decision trees, neural networks, genetic algorithms, etc.) and apply them to solve problems.
3. The student will explain different heuristic optimization techniques (for e.g., simulated annealing, tabu search, etc.) and apply them to solve problems.
4. The student will explain different reinforcement learning techniques (for e.g., softmax, dynamic programming, Q-learning, etc.) and apply them to solve problems.

UNIVERSITY POLICIES

Attendance Policy: Students are required to read and be prepared to discuss the assigned textbook chapters and workbook exercises on the scheduled class days. Class attendance and lateness policies will be discussed during the first week of class.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance**. Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. Contact the Financial Aid Office for more information.

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Academic Integrity: It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. According to the UT System Regents' Rule 50101, §2.2, "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts."

Student Support Services Available: The University of Texas at Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. These resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals to resources for any reason, students may contact the Maverick Resource Hotline at 817-272-6107 or visit www.uta.edu/resources for more information.

Electronic Communication Policy: The University of Texas at Arlington has adopted the University "MavMail" address as the sole official means of communication with students. MavMail is used to remind students of important deadlines, advertise events and activities, and permit the University to conduct official transactions exclusively by electronic means. For example, important information concerning registration, financial aid, payment of bills, and

graduation are now sent to students through the MavMail system. All students are assigned a MavMail account. ***Students are responsible for checking their MavMail regularly.*** Information about activating and using MavMail is available at http://www.uta.edu/oit/email/. There is no additional charge to students for using this account, and it remains active even after they graduate from UT Arlington.

To obtain your NetID or for logon assistance, visit https://webapps.uta.edu/oit/selfservice/. If you are unable to resolve your issue from the Self-Service website, contact the Helpdesk at helpdesk@uta.edu.

THE INSTRUCTOR RESERVES THE RIGHT TO MAKE CHANGES TO THE SYLLABUS AS NECESSARY; IT IS THE STUDENT'S RESPONSIBILITY TO BE AWARE OF THESE CHANGES.