CS 431 – Advanced Topics in AI

Outline

Description

- A survey of selected advanced topics in artificial intelligence.
  - Intelligent agents
  - Handling uncertainty (Bayes rule, probabilistic reasoning, belief nets, decision making, utility function)
  - Machine learning (concepts, belief nets, reinforcement learning)
  - Evolutionary computing (concepts, genetic algorithms)
  - Data mining and knowledge discovery (concepts and techniques)
  - Natural language processing (concepts and techniques – time permitting)

Goals

- To introduce advanced techniques in machine reasoning and learning
- To enhance intelligent system design and implementation skills
- To introduce practical challenges in AI (data mining and NLP)
- To provide a foundation for research and development and advanced courses in AI
- To broaden comprehension of AI concepts, techniques and applications

Grading

- Allocations
  - Quizzes (5-6) 20%
  - Assignments (2-3) 10%
  - Term paper 15%
  - Mid-Term Exam 25%
  - Final Exam (comprehensive) 30%

Policies

- Quizzes: All quizzes will be announced a day or two in advance.
- Sharing: No copying is allowed for assignments. Discussions are encouraged; however, you must submit your own work. Violators can face mark reduction.
- Plagiarism: Do NOT pass someone else’s work as yours! Write in your words and cite the reference.
- Submission policy:
  - Due at the day and time specified.
  - 1 day late with 10% penalty; 2 day late with 20% penalty; not accepted after 2 days.
  - An extension will be granted only if there is a need and when requested several days in advance.

Term Paper

- Survey of literature on a topic of current research and development (algorithms, concepts, approaches, models, implementations, challenges, directions, trends, etc)
  - Group of 2 students
  - Topic of student interest or chosen from a given list
  - Several stages of evaluation: topic selection, bibliography, abstract, and final report
  - I am not planning on a presentation

These are tentative guidelines. Final details will be communicated soon.
Summarized Course Contents

- Intelligent agents (1 week)
- Handling uncertainty: probabilistic approaches and introduction to other approaches (3 weeks)
- Machine learning (2 weeks)
- Evolutionary computing (1 week)
- Data mining and knowledge discovery (3 weeks)
- Natural language processing (1 week – time permitting)

Depending on class dynamics the time given to the modules can vary from those indicated.

Texts

- Required
  - Handouts (from books, articles, etc)
- Other resources
  - Books in library
  - Journal and magazine articles
  - Web

Supplementary Resources (1)

- Intelligent Agents
  - Constructing intelligent agents with Java; a programmer’s guide to smarter applications, Bigus and Bigus, 006.3 B594C 1998
  - Multiagent systems; a modern approach to distributed artificial intelligence, Weiss, 006.3 M961 2000
  - Creating cool intelligent agents for the net, Lesnick and Moore, 004.678 L657C 1997

- Genetic Algorithms
  - An introduction to genetic algorithms, Mitchell, 003.3 M681I 2001

Supplementary Resources (2)

- Bayesian Methods/Handling Uncertainty
  - Bayesian data analysis, Gelman et al., 519.542 B357 1997
  - Analysis of decisions under uncertainty, Schlaifer, 658.403 S28A 1969
- Data Mining and Knowledge Discovery
  - Principles of data mining, Hand et al., 006.3 H236P 2001
  - Machine learning and data mining; methods and applications, Michalski et al., 006.31 M149 1999
  - Data mining and uncertain reasoning; an integrated approach, Chen, 006.321 C518D 2001
  - Graphical models; methods for data analysis and mining, Borgelt and Kruse, 006.3 B732G 2001
  - Data mining solutions; methods and tools for solving real-world problems, Westphal and Blaxton, 006.3 W537D 1998
  - Mastering data mining; the art and science of customer relationship management, Barry and Linoff, 006.3 B534M 2000

Course Web Site

- For announcements, lecture slides, handouts, assignments, quiz solutions, web resources:
  - http://suraj.lums.edu.pk/~cs431w02/

- Resource page has links to information available on the Web. It is basically a meta-list for finding further information.

Other Stuff

- How to contact me?
  - Office hours: 10.30 AM to 12 noon MW (office: 132)
  - E-mail: akarim@lums.edu.pk
  - Stop by my office
  - By appointment

- Philosophy
  - Knowledge cannot be taught; it is learned.
  - Be excited. That is the best way to learn. I cannot teach everything in class. Develop a inquisitive mind, ask questions, and go beyond what is required.
  - I don’t believe in strict grading. But… there has to be a way of rewarding performance.
Knowledge Discovery

- Identifying patterns in geographically distributed data (e.g. daily rainfall averages, annual sales at stores, etc)

Handwriting Recognition (NLP)