ComS 572: Principles of Artificial Intelligence
Department of Computer Science
Iowa State University

Instructor

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Course Schedule

Lectures: Monday, Wednesday, and Friday, 12:10-1:00 pm, ATANSFF B0029

Course Prerequisites

- Knowledge of data structures (lists, trees, graphs etc.), algorithms (design and analysis), and programming experience in a contemporary high-level language, such as C, C++, Java.
- Knowledge of discrete mathematics, calculus, and basic probability theory.

Some of the laboratory assignments may require you to program in Java. If you do not know Java already, you are expected to quickly acquire a working knowledge of Java on your own.

If you are not sure whether you have the necessary background, please talk to the instructor.

Target Audience

This course is targeted to beginning graduate students in Computer Science. The course should be of interest to graduate students from a variety of disciplines (e.g., statistics, physics, mathematics, engineering, and neuroscience) interested in learning about Artificial Intelligence and applying Artificial Intelligence approaches in their work.

Course Objectives

The primary objective of this course is to provide an introduction to the basic principles and applications of Artificial Intelligence. Programming assignments are used to help clarify basic concepts. The emphasis of the course is on teaching the fundamentals, and not on providing a mastery of specific commercially available software tools or programming environments. In short, this course is about the design and implementation of intelligent agents---software or hardware entities that perform useful tasks with some degree of autonomy. Upon successful completion of the course, students will have an understanding

of the basic areas of artificial intelligence including problem solving, knowledge representation, reasoning, decision making, planning, and learning -- and their applications (e.g., data mining, information retrieval). Students will also be able to design and implement key components of intelligent agents of moderate complexity and evaluate their performance.

Course Learning Outcomes

- Appreciation of fundamental problems in artificial intelligence (AI).
- Ability to generate precise formulation(s) of AI problems in terms of knowledge representation and search from imprecise English description(s).
- Ability to design intelligent agents for problem solving, reasoning, planning, decision making, and learning.
- Ability to make intelligent choices from among available algorithms and knowledge representation schemes subject to specific design and performance constraints, and when needed, design variants of existing algorithms.
- Ability to implement and evaluate intelligent agents for representative AI problems – e.g., automated theorem proving, learning classification rules from data, etc.
- Familiarity with some current applications of AI.
- Ability to communicate effectively about AI problems, algorithms, implementations, and their experimental evaluation.

Textbook

- Artificial Intelligence: A Modern Approach, 3rd Edition, by Stuart Russell and Peter Norvig.

The course will sometimes draw upon additional references and readings to supplement the treatment of topics available in the primary textbook.

Topics

The following gives a tentative list of topics to be covered in the course

Overview: what is artificial intelligence (AI)? History of AI.

Intelligent agents: rationality, task environments, structure of agents.

Problem-solving through Search: formulation of state-space search problems, uninformed, heuristic, and local search algorithms, constraint satisfaction problems (CSPs), games, sample applications.

Knowledge Representation and Reasoning: knowledge representation using logic, propositional logic, first-order logic, inference, sample applications.

Representing and Reasoning with Uncertain Knowledge: probability theory, Bayesian networks, probabilistic inference, sample applications.

Making Decisions: Markov decision process (MDP)

Machine Learning: supervised learning, classification, Naive Bayes, neural networks, sample applications.

Student project presentations.

Grading Policy

The grades in ComS 572 will be based on problem sets, laboratory assignments (involving programming), a term project (requiring both written and oral reports), and two exams. These components will be weighted as follows in assigning an overall numeric score:

- Problem Sets: 25%
- Laboratory assignments: 20%
- Midterm Exam: 20%
- Term project: 15%
- Final Exam: 20%

Students are guaranteed to receive the letter grade based on the scales shown below. However, the instructor reserves the right to modify the grading scale so as to improve the letter grade if warranted by the circumstances (e.g., unusually high level of difficulty of problem sets).

- >= 93%   A
- 89% < 93% A-
- 85% < 89% B+
- 80% < 85% B
- 75% < 80% B-
- 70% < 75% C+
- 65% < 70% C
- 60% < 65% C-
- 55% < 60% D+
- 50% < 55% D
- 45% < 50% D-
- <45%   F

Grades may be appealed for ONE WEEK after they are distributed (except the final exam which will be by request only). After the appeal period has expired, grade change requests may be denied.

Policy on Late Submission of Assignments

Laboratory Assignments

There is a late penalty of 5% of the grade per day up to a maximum of 7 days from the specified due date. Submissions that are turned in later than 7 days after the due date will be assigned zero credit. Rare exceptions to this policy might be made, at the discretion of the course staff, under demonstrably extenuating circumstances.

Problem Sets

There is a late penalty of 10% of the grade per day up to a maximum of 4 days from the specified due date. Submissions that are turned in later than 4 days after the due date will be assigned zero credit. Rare exceptions to this policy might be made, at the discretion of the course staff, under demonstrably extenuating circumstances.

Term Projects

Term projects (including code, data, and written report) are to be turned in no later than the due date. Rare exceptions to this policy might be made, at the discretion of the course staff, under demonstrably extenuating circumstances, resulting in the assignment of an 'incomplete' grade.

Class discussion forum

We will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the instructor, and the TA. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/iastate/fall2018/coms572/home

Academic Dishonesty

The class will follow Iowa State University's policy on academic dishonesty. Anyone suspected of academic dishonesty will be reported to the Dean of Students Office. Any student found responsible for academic misconduct will receive a failing grade (F) in the

course. The dean of students may impose additional actions (ranging from a disciplinary reprimand to expulsion from the university).

Discussion of general concepts and questions concerning the homework and laboratory assignments among students is encouraged. However, each student is expected to work on the solutions individually (except in the case of assignments that are explicitly assigned to teams of students).

Laboratory Assignments

When discussing code with other students, you may:

- discuss algorithms, data structures, and implementation strategies
- assist in debugging, possibly by suggesting diagnostic print statements or test cases
- provide or receive help in understanding the code that is supplied to the class

It is expected that you have written EVERY LINE OF CODE that you submit (with the exception of code given out in class) as part of your solution for a lab assignment. The following are examples of activities that are PROHIBITED:

- Writing code with another student
- Copying code from another student
- Sharing code with another student (via email, printouts, web, ftp sites, etc.)
- Posting code in a location that is accessible to others
- Using code fragments provided by other students (including students who had taken the course in the past)
- Using code fragments that are freely available (e.g., in public repositories) without properly acknowledging and citing the source

Problem Sets

When discussing problems from assigned problem sets with other students, you may:

- discuss the material presented in class or included in the assigned readings needed for solving the problem(s)
- assist another student in understanding the statement of the problem (e.g., you may assist a non-native speaker by translating some English phrases unfamiliar to that student)

It is expected that you have independently arrived at solutions that you turn in for problem sets. The following are examples of activities that are PROHIBITED:

- sharing solutions or fragments of solutions (via email, whiteboard, handwritten or printed copies, etc.)
- posting solutions or fragments of solutions in a location that is accessible to others

- using solutions or fragments of solutions provided by other students (including students who had taken the course in the past)
- using solutions or solution fragments obtained on the Internet or from solution manuals for text books

Emergency Awareness

- Call 911 in an emergency. Report suspicious activity or objects to ISU Police at 515-294-4428.
- During a campus emergency, go to www.iastate.edu for additional information.
- Classroom management emergencies
  - Call ISU Police for immediate health/safety classroom concerns at 515-294-4428.
  - For other concerns regarding classroom management, contact the instructor and/or chair of the academic department for guidance.
- Know the following information posted in your building Emergency Map
  - Locate the evacuation routes
  - Locate the severe weather shelter areas
- Keep your contact information up-to-date in the ISU Alert
- Additional emergency information is available at www.ehs.iastate.edu/prep/students.
- ISU PD Facebook (www.facebook.com/ISUPD) and Twitter (www.twitter.com/ISUPD)
- To be better prepared during an act of violence on campus and understand the principles of A-D-D (Avoid Deny Defend), please attend Violent Incident Response Training (VIRT).

Disability Accommodation

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. Students requesting accommodations for a documented disability are required to meet with staff in Student Accessibility Services (SAS) to establish eligibility and learn about related processes. Eligible students will be provided with a Notification Letter for each course and reasonable accommodations will be arranged after timely delivery of the Notification Letter to the instructor. Students are encouraged to deliver Notification Letters as early in the semester as possible. SAS, a unit in the Dean of Students Office, is located in room 1076 Student Services Building or online at www.sas.dso.iastate.edu. Contact SAS by email at accessibility@iastate.edu or by phone at 515-294-7220 for additional information.

Dead Week

This class follows the Iowa State University Dead Week policy as noted in section 10.6.4 of the Faculty Handbook http://www.provost.iastate.edu/resources/faculty-handbook .

Harassment and Discrimination

Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Student Assistance at 515-294-1020 or email dso-sas@iastate.edu, or the Office of Equal Opportunity and Compliance at 515-294-7612.

Religious Accommodation

If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor or supervisor will review the request. You or your instructor may also seek assistance from the Dean of Students Office or the Office of Equal Opportunity and Compliance.

Contact Information

If you are experiencing, or have experienced, a problem with any of the above issues, email academicissues@iastate.edu.