Orientation: Syllabus

Com S 472/572 - Syllabus

Com S 472/572 Syllabus (Fall 2020)

Course Information

- Instructor: **Yan-Bin Jia** **(http://www.cs.iastate.edu/~jia/)**
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- **Lectures**: Monday, Wednesday & Friday 11:00-11:50am (**asynchronous**)
  Recitation: Thursday 9:00-9:50am (**synchronous** on **Webex** **(https://iastate.webex.com/meet/muxiao)** by TA Xiaoqian Mu)

Couse Format

> All lectures will be performed via release of videos by the instructor. Typically before the scheduled time of every lecture, two recorded video segments will be available under the Pages tab on Canvas. Recitations will be live on Webex. Problem sets, projects, essay, and exams will be given out, turned in, and graded online.

Prerequisites

> - Com S 311: knowledge of data structures (lists, tree, graphs, etc.) and algorithms (design and analysis);
> - Stat 305 or 330: knowledge of discrete mathematics, calculus, and basic probability theory;
> - Engl 250;
> - SP CM 212;
> - Java programming experience.
>
> Undergraduate students who have missing pre/co-requisite courses must either drop the class or, if you feel you have an adequate background to be in the course, submit the **pre/co-requisite waiver request form** to the instructor to request a prerequisite/co-requisite waiver during the first week of classes.
>
> If you are not sure whether you have the necessary background, please talk to the instructor.

Course Goals and Objectives

> The primary objective of this course is to provide an introduction to the basic principles and applications of Artificial Intelligence. Programming projects 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.

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 & Online Resources

- S. Russell and P. Norvig. *Artificial Intellgience: A Modern Approach* (4th edition). Pearson Education, Inc., 2020. ISBN: 9780134610993

Online resources are available at the book's website: http://aima.cs.berkeley.edu/ **(http://aima.cs.berkeley.edu/)** . They include, in particular,

- **Exercises**, programming projects, and research projects.
- Code that implements the algorithms in the book.
- Supplementar material and links.

Topics

Tentatively, we will cover the following topics (with hour estimates):

1. Introductions to Course and AI (1.5)
2. Intelligent Agents (1.5)
3. Search (8)
    - uninformed search

    - informed search: A* & heuristics
    - local search: hill-climbing, simulated annealing
    - and-or search & partial observation
4. Adversarial Search (3)
    - minimax & alpha-beta cutoff
    - pruning
    - gaming
5. Constraint Satisfaction (3)
    - constraint propagation
    - backtracking
    - local search
6. Propositional Logic (4)
    - wumpus world & logic
    - propositional logic
    - theorem proving, resolution & Horn clause
    - model checking & agents
7. First-Order Logic (3)
    - syntax & semantics
    - usage
    - knowledge engineering
8. First-Order Logic Inference (3)
    - unification
    - forward & backward chaining
    - resolution
9. Planning (2)
    - classical planning
    - scheduling
10. Quantifying Uncertainty (3)
    - basic probability
    - inference & independence

    - Bayes' rule
11. Bayesian Networks (4)
    - semantics
    - conditional distribution
    - exact inference
    - approximate inferences
12. Machine Learning (5)
    - supervised learning
    - decision trees
    - learning theory
    - linear regression
    - nonparametric models

Evaluation

A certain level of self-study is required. You are expected to pursue ideas and topics discussed in this course on your own beyond the lectures.

For graduate credit, you need to complete an essay on some additional topic assigned by the instructor or self-chosen with the instructor's approval. The essay is expected to branch out to a topic in AI either not introduced or not covered in depth in the lectures, often through reading of one or more related research papers. The essay will require 20 to 30 hours of self-study and writing, and make up 10% of the total graduate grade.

Grades will be on the following scales:

	Problem Sets	Projects	Midterm	Final	Essay
Undergrad	30%	20%	20%	30%	
Grad	27%	18%	18%	27%	10%

> Your final grade will be decided by the following tentative **grading scale** subject to minor adjustments.
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> | | |
> |---|---|
> | at least 87 | A |
> | at least 82 but less than 87 | A- |
> | at least 77 but less than 82 | B+ |
> | at least 72 but less than 77 | B |
> | at least 67 but less than 72 | B- |
> | at least 62 but less than 67 | C+ |
> | at least 57 but less than 62 | C |
> | at least 52 but less than 57 | C- |
> | at least 49 but less than 52 | D+ |
> | at least 45 but less than 49 | D |
> | at least 42 but less than 45 | D- |
> | less than 42 | F |
>
> ---

Problem Sets and Projects

> Problem sets will be posted on Canvas on a biweekly basis. Most problems, if not all, are expected to be from the course's website: `https://aimacode.github.io/aima-exercises/` **(https://aimacode.github.io/aima-exercises/)**. Two programming projects will be given out, with **Java implementation** required. If you do not know Java already, you are expected to quickly acquire a working knowledge of Java on your own.
>
> Submission of every problem set or project will be made on Canvas. **No late submission** will be accepted. No problem set or project will be due in the first week, the last week, or the midterm exam week.

Exams

> There will be a midterm exam on **Monday October 5** and a final exam to be determined. Both exams will be **online** and, to cope with varying home internet speeds, they will be each allocated some **extra time no less than the normal time** if taken on campus. For example, a 75-minute midterm exam in class would be given 150 or more minutes online with no change of the difficulty level.

Office Hours

> Listed in the file named `Weekly Schedule` under `Modules->Instruction Resources` on Canvas, or by appointment. You are welcome to ask questions regarding lecture material, problem sets, projects, or exams.
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> All office hours will be held **online via Webex**. The links are as below:
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> Yan-Bin: **https://iastate.webex.com/meet/jia (https://iastate.webex.com/meet/jia)**
> Xiaoqian: **https://iastate.webex.com/meet/muxiao (https://iastate.webex.com/meet/muxiao)**
> Yuechuan: **https://iastate.webex.com/meet/yuechuan (https://iastate.webex.com/meet/yuechuan)**

General Contact Instructions

> If you have a general question about the course or about an assignment, the best place to start is on one of the Canvas discussion topics, where it will be seen by the instructor, the TAs, and the rest of the class. However, please do not post personal information, or your solution to an assignment, on Canvas. If a quick response is preferred, you may consider e-mailing the instructor (**jia@iastate.edu (mailto:jia@iastate.edu)**) or the TAs (**muxiao@iastate.edu (mailto:muxiao@iastate.edu)** and **yuechuan@iastate.edu (mailto:yuechuan@iastate.edu)**)

Academic Honesty

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** (https://www.celt.iastate.edu/teaching/preparing-to-teach/how-to-create-an-effective-syllabus/recommended-iowa-state-university-syllabus-statements/) under the guidance of **Student Disciplinary Regulations** (https://www.policy.iastate.edu/policy/SDR). If found responsible for the alleged violations, a disciplinary sanction will be imposed as described in **Academic Misconduct** (https://catalog.iastate.edu/academic_conduct/#academicdishonestytext).

In this course, you may discuss assignments with other students. (Do not assume this is true in all your courses!) We expect you to think through and fully understand assignment solutions. Thus, the solutions you turn in must be written based on your own understanding. Plagiarism will be dealt with harshly. You should consult the University Policy for details regarding academic misconduct and its consequences.

Projects

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.

Accessibility Statement

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 work directly with staff in Student Accessibility Services (SAS) to establish eligibility and learn about related processes before accommodations will be identified. After eligibility is established, SAS staff will create and issue a Notification Letter for each course listing approved reasonable accommodations. This document will be made available to the student and instructor either electronically or in hard-copy every semester. Students and instructors are encouraged to review contents of the Notification Letters as early in the semester as possible to identify a specific, timely plan to deliver/receive the indicated accommodations. Reasonable accommodations are not retroactive in nature and are not intended to be an unfair advantage. Additional information or assistance is available online at **www.sas.dso.iastate.edu (http://www.sas.dso.iastate.edu)** , by contacting SAS staff by email at accessibility@iastate.edu, or by calling 515-294-7220. Student Accessibility Services is a unit in the Dean of Students Office located at 1076 Student Services Building.

Disabilities for Special Accommodations

> Iowa State University complies with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act. Any student who may require an accommodation under such provisions should contact the instructor as soon as possible and no later than the end of the first week of class or as soon as you become aware. Please obtain a SAAR (Student Academic Accommodation Request) form verifying your disability and specifying the accommodation you will need. No retrospective accommodations will be required in this class.

COVID-19 Health and Safety Requirements

> Students are responsible for abiding by the university's **COVID-19 health and safety expectations (https://www.dso.iastate.edu/guidance-for-supporting-community-expectations-during-covid-19-pandemic)** . All students attending this class in-person are required to follow university **policy (https://web.iastate.edu/sites/default/files/safety/COVID-19/fall/ISU%20COVID%20face%20covering%20policy.pdf)** regarding health, safety, and face coverings::
>
> - wear a cloth face covering in all university classrooms, laboratories, studios, and other in-person instructional settings and learning spaces. Cloth face coverings are additionally required to be worn indoors in all university buildings, and outdoors when other people are or may be present where physical distancing of at least 6 feet from others is not possible. Students with a documented health or medical condition that prevents them from wearing a cloth face covering should consult with **Student Accessibility Services (https://sas.dso.iastate.edu/)** in the Dean of Students Office.
> - ensure that the cloth face covering completely covers the nose and mouth and fits snugly against the side of the face.
> - practice physical distancing to the extent possible.
> - assist in maintaining a clean and sanitary environment.
> - not attend class if you are sick or experiencing symptoms of COVID-19.
> - not attend class if you have been told to self-isolate or quarantine by a health official.
> - follow the instructor's guidance with respect to these requirements. Failure to comply constitutes disruptive classroom conduct. Faculty and teaching assistants have the authority to deny a non-compliant student entry into a classroom, laboratory, studio, conference room, office, or other learning space.

> These requirements extend outside of scheduled class time, including coursework in laboratories, studios, and other learning spaces, and to field trips. These requirements may be revised by the university at any time during the semester.
>
> In accordance with university policy, instructors may use a face shield while they are teaching as long as they are able to maintain 8 feet of physical distance between themselves and students during the entire instructional period. Some form of face covering must be worn at all times in learning spaces regardless of the amount of physical distancing.
>
> Faculty may refer matters of non-compliance to the Dean of Students Office for disciplinary action, which can include restrictions on access to, or use of, university facilities; removal from university housing; required transition to remote-only instruction; involuntary disenrollment from one or more in-person courses; and other such measures as necessary to promote the health and safety of campus.
>
> It is important for students to recognize their responsibility in promoting the health and safety of the Iowa State University community, through actions both on- and off-campus. The university's faculty asks that you personally demonstrate a commitment to our **Cyclones Care campaign (https://www.care.iastate.edu/)**. Iowa State University's faculty support the Cyclones Care campaign and ask you personally to demonstrate a commitment to our campaign. Your dedication and contribution to the campaign will also protect your family, classmates, and friends, as well as their friends and families. Our best opportunity for a successful fall semester with in-person learning and extramural activities requires all of us to collaborate and fully participate in the Cyclones Care campaign.

Prep Week

> This class follows the Iowa State University Prep Week policy as noted in section 10.6.4 of the **Faculty Handbook (https://www.provost.iastate.edu/sites/default/files/uploads/faculty%20resources/policies/Faculty%20Handbook%20-%20January%202020%20final.pdf)**.

Discrmination and Harassment

> Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. Veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3410 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515-294-7612, Hotline 515-294-1222, email **eooffice@iastate.edu (mailto:eooffice@iastate.edu)** .

Religious Accommodation

> Iowa State University welcomes diversity of religious beliefs and practices, recognizing the contributions differing experiences and viewpoints can bring to the community. There may be times when an academic requirement conflicts with religious observances and practices. If that happens, students may request the reasonable accommodation for religious practices. In all cases, you must put your request in writing. The instructor will review the situation in an effort to provide a reasonable accommodation when possible to do so without fundamentally altering a course. For students, you should first discuss the conflict and your requested accommodation with your professor at the earliest possible time. You or your instructor may also seek assistance from the **Dean of Students Office (https://www.studentassistance.dso.iastate.edu/)** at 515-294-1020 or the **Office of Equal Opportunity (https://www.eoc.iastate.edu/)** at 515-294-7612.

Contact Information for Academic Issues

> If you are experiencing, or have experienced, a problem with any of the above issues, email **academicissues@iastate.edu (mailto:academicissues@iastate.edu)** .
>
> (Important note to faculty: The email address for contact information is monitored and answered through the Office of the Senior Vice President and Provost)

Emergency Awareness

- For an immediate emergency, call **ISU Police** (http://www.police.iastate.edu/) at 515-294-4428.
- During a campus emergency, go to **www.iastate.edu** (http://www.iastate.edu/) for additional information.
- Classroom management emergencies
  - For immediate health/safety concerns, call ISU Police at 515-294-4428.
  - For other concerns regarding classroom management, contact the instructor and/or the chair of the academic department for guidance.
- Know the following information posted in your building **Emergency Map** (https://www.ehs.iastate.edu/prep/building-information).
  - Locate the evacuation routes.
  - Locate the severe weather shelter areas (on the emergency map).
- Keep your contact information up-to-date in the **ISU Alert** (https://www.isualert.iastate.edu/).
- Additional emergency information is available at **www.ehs.iastate.edu/prep/students** (http://www.ehs.iastate.edu/prep/students).
- ISU PD Facebook (**www.facebook.com/ISUPD** (http://www.facebook.com/ISUPD)) and **Twitter** (http://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)** (http://www.police.iastate.edu/content/violent-incident-response-training-virt).