CS 162 Syllabus

12 November 2012

Welcome to CS162, an introduction to the processes by which machines simulate intelligence. Topics include knowledge representation techniques, including the predicate logic, state-space problem formulation, logical reasoning methods, exhaustive and heuristic search strategies, rule-based production systems, and examples of expert systems.

Wednesday 6–9:40 pm in LLC 234
Three credits, prerequisite: CS117.

Contact information

Instructor: Prof. Christopher League, Ph.D.

Email: christopher.league@liu.edu – please include course number in subject.

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Office hours: Monday 1:30–2:20; Wednesday 1:30–2:20 and 5:00–5:50

Office location: LLC 206

Resources

Software: VirtualBox 4.x, setup explained in first assignment.

Web sites: https://blackboard.liu.edu/

Text: *Artificial Intelligence: A Systems Approach* by M. Tim Jones (ISBN 978-0-7637-7337-3)

Library: Campus library resources tailored for computer science are available at http://www2.brooklyn.liu.edu/library/wlp/LibPortal-CS-BC.htm

Requirements

Your grade will be computed based on assignments, exams, quizzes, and participation. There are a total of 1,000 points available, broken down as follows:

- There will be **7 assignments** during the semester. Assignments are worth **68 points each**, but I will **drop the lowest score** so only 6 will count, for a total of **408 points**.
- There are **6 quizzes** scheduled throughout the semester, to make sure you are following along and reviewing your notes after each meeting. Quizzes are worth **40 points each**, but I will **drop the lowest two scores** so only 4 will count, for a total of **160 points**.
- There will be a midterm and final exam, worth **200 points each** for a total of **400 points**.
- The remaining **32 points** are for your attendance and participation in class.

On the 1,000-point scale, you can expect the following letter grades:

		≥ 870:	B+	≥ 770:	C+	≥ 670:	D+
≥ 930:	A	≥ 830:	B	≥ 730:	C	≥ 600:	D
≥ 900:	A–	≥ 800:	B–	≥ 700:	C–	else:	F

In the end, I may choose to adjust the scale slightly to compensate for assignments or questions that turned out to be trickier than I intended. Such adjustments would never *lower* your grade from what is designated in the above table; if you get 930 points, you are guaranteed an **A**.

Policies

No late assignments will be accepted, because we will discuss and evaluate your work promptly after the deadline. This helps to ensure that everyone receives timely feedback, and that you can learn from mistakes while they are still fresh in your mind.

There will be no extra credit. Students usually ask for extra credit late in the semester after they have already messed up their original opportunities. Be sure to start your work early, so that we can detect and solve any problems before they can affect your grade.

Plagiarism is the use or presentation of ideas, words, or work that is not one's own and that is not common knowledge, without granting credit to the originator. Plagiarism is a practice that is not only unacceptable, but which is to be condemned in the strongest terms possible on the basis of moral, educational and legal grounds. Under University policy, plagiarism may be punishable by a range of penalties from a failing grade in the assignment or course to dismissal from the School of Business, Public Administration and Information Sciences. All students are required to read the handbook on avoiding plagiarism by visiting `http://bit.ly/1VShWN`

Cheating includes, but is not limited to the following: falsification of statements or data; listing sources that have not been used; having another individual write your paper or do your assignments; writing a paper or creating work for another student to use without proper attribution; purchase of paper or research work for one's submission as his/her own work; using written, verbal, or electronic or other sources of aid during an examination (except when expressly permitted by the instructor, depending on the nature of the examination) or knowingly providing such assistance to aid other students.

Showing up on time to class every week is extremely important. If you must be absent or more than 5 minutes late, please try to notify me in advance. I will be keeping track of whether you are in class, and when you arrive. A few missed classes will not count against you, but habitual absence will significantly hurt your grade. Additionally, there will be no make-up quizzes. I do not distinguish between 'excused' and 'unexcused' absence. Unless you miss an *exam* due to a severe medical emergency, I don't want to see a doctor's note. If you do miss an exam, the make-up exam will be different – and probably *not* easier.

Long Island University seeks to provide reasonable accommodations for all qualified persons with disabilities. This University will adhere to all applicable federal, state and local laws, regulations and guidelines with respect to providing reasonable accommodations as required to afford equal educational opportunity. It is the student's responsibility to register with Special Education Services (SES) as early as possible and to provide faculty members with the formal communication from SES for suitable accommodations. All accommodations must be approved through SES. Contact Information: 718 488 1221 or 718 488 1044.

Time commitment

New York State defines one credit as a total of 15 hours instructional time, plus 30 hours of student preparation. Thus, a typical three-credit course will amount to 45 hours instruction plus 90 hours preparation. (For these computations, an 'hour' actually consists of 50 minutes.)

To do well on the quizzes, assignments, and exams, you will have to spend significant time preparing outside of class. We estimate about **1-2 hours** preparing (reading, reviewing, practicing) for each hour of class time.

In addition, assignments will take approximately **6–8 hours** each to complete (keeping in mind that earlier assignments will require less time than later ones).

- Lecture time: 3 hours per week × 15 weeks = 45 hours
- Preparation time (reading, reviewing, practicing): 6 hours per week × 15 weeks = 90 hours
- Assignment completion (problem-solving): 7 hours per assignment × 7 assignments = 49 hours
- **Total: 184 hours**

Goals and objectives

After this course ends, I expect that you will be able to…

- understand the basic concepts and problem-solving methods underlying symbolic artificial intelligence, including knowledge representation, heuristics, search strategies, and constraints.

- train a 'machine learning' algorithm in a classification task, applying concepts such as entropy and training data vs. test data.
- solve optimization problems using evolutionary techniques, applying concepts such as descent with modification, fitness, and selective survival.
- analyze search problems (e.g. water jug or river-crossing puzzles) in terms of state representations and transitions.
- assess the reality and implications of claims made about artificial intelligence in the news and in science fiction.

Schedule

Wed 5 Sep Meeting 1 at 6 pm: Introduction, history of AI, search space graphs.

Wed 12 Sep Meeting 2 at 6 pm: Uninformed search — breadth-first, depth-first, and uniform-cost. *Read ch. 2.* **Assignment 1** due at 1 am.

Wed 19 Sep Meeting 3 at 6 pm: Informed search — best-first and A⋆. *Read ch. 3 thru p. 65.* **Quiz 1. Assignment 2** due at 1 am.

Wed 26 Sep Meeting 4 at 6 pm: Constraint satisfaction. *Read p. 81–86 of ch. 3.* **Quiz 2.**

Wed 3 Oct Meeting 5 at 6 pm: Minimax game search. *Read ch. 4 thru p. 109.* **Assignment 3** due at 1 am.

Wed 10 Oct Meeting 6 at 6 pm: Video game AI. *Read p. 121–139 of ch. 4.* **Quiz 3.**

Wed 17 Oct Meeting 7 at 6 pm: Knowledge representation and logic. *Read ch. 5 thru p. 163.* **Assignment 4** due at 1 am.

Wed 24 Oct Midterm exam at 6 pm:

Wed 31 Oct Meeting 9 at 6 pm: Supervised learning with decision trees. *Read ch. 6 thru p. 176.*

Wed 7 Nov Meeting 10 at 6 pm: Unsupervised learning with Markov models. *Read p. 176–193 of ch. 6.*

Wed 14 Nov Meeting 11 at 6 pm: Evolutionary computation — genetic algorithms. *Read ch. 7 thru p. 211.* **Quiz 4.**

Wed 21 Nov Assignment 5 due at 1 am.

Wed 28 Nov Meeting 12 at 6 pm: Genetic programming. *Read p. 211–220 of ch. 7.* **Quiz 5.**

Wed 5 Dec Meeting 13 at 6 pm: Perceptrons and neural network architecture. *Read ch. 8 thru p. 261.* **Assignment 6** due at 1 am.

Wed 12 Dec Meeting 14 at 6 pm: Neural network learning with LMS and back-propagation. *Read p. 262–275 of ch. 8.* **Quiz 6.**

Mon 17 Dec Assignment 7 due at 1 am.

Wed 19 Dec Final exam at 6 pm: