



Syllabus
Computer Science 600.435
Artificial Intelligence
Spring, 2017
(3 credits, EQ)

Description

The course situates the study of Artificial Intelligence (AI) first in the broader context of Philosophy of Mind and Cognitive Psychology and then treats in-depth methods for automated reasoning, automatic problem solvers and planners, knowledge representation mechanisms, game playing, machine learning, and statistical pattern recognition. The class is recommended for all scientists and engineers with a genuine curiosity about the fundamental obstacles to getting machines to perform tasks such as deduction, learning, and planning and navigation. Strong programming skills and a good grasp of the English language are expected; students will be asked to complete both programming assignments and writing assignments. The course will include a brief introduction to scientific writing and experimental design, including assignments to apply these concepts.

Prerequisites

Data Structures (600.226 or equivalent)
Discrete Mathematics (550.171 or equivalent)

Instructor

Professor Philipp Koehn, phi@jhu.edu, www.cs.jhu.edu/~phi/
Office: Hackerman 227, 410 516-3427
Office hours: Tuesdays 3:00–4:00 pm, and by appointment

Teaching Assistant

TBA
Office: TBA
Office hours: TBA

Meetings

Tuesdays, Thursdays, 1:30–2:45 am, Hodson 213

Textbook (required)

Russell and Norvig, *Artificial Intelligence - A Modern Approach*, 3rd edition, Prentice Hall (2009)

Online Resources

The course web site is www.cs.jhu.edu/~phi/ai/

Course Objectives

- (1) Students will learn about the broader context of artificial intelligence.
- (2) Students will learn core concepts in artificial intelligence, such as heuristic search, game playing, formal logic, knowledge representation, decision theory, machine learning, and natural language processing
- (3) Students will apply this knowledge in programming assignments

Course Topics

Artificial Intelligence in Context

- Th Feb 2 AI in the Public Imagination
- Tu Feb 7 Philosophy of Mind
- Th Feb 9 Cognitive Neuroscience
- Tu Feb 14 Cognitive Psychology
- Th Feb 16 TBD

Intelligent Agents, Heuristic Search, and Game Playing

- Tu Feb 21 Intelligent Agents
- Th Feb 23 Basic Search
- Tu Feb 28 Informed Search
- Th Mar 2 Game Playing
- Tu Mar 7 Constraint Satisfaction

Logic and Knowledge Representation

- Th Mar 9 Logical Agents
- Tu Mar 14 First Order Logic
- Th Mar 16 Inference in First-Order Logic
- Tu Mar 28 Knowledge Representation
- Th Mar 30 Planning

Uncertainty

- Tu Apr 4 Probabilistic Reasoning
- Th Apr 6 Bayesian Networks
- Tu Apr 11 Markov Decision Processes
- Th Apr 13 Decision Theory

Machine Learning

- Tu Apr 18 Statistical Learning
- Th Apr 20 Neural Networks
- Tu Apr 25 Reinforcement Learning

Natural Language

- Th Apr 27 Natural Language Processing
- Tu May 2 Machine Translation

Course Expectations & Grading

Grading is based on four homework assignments and one final exam.

Assignments & Readings

Readings are announced on the course web site for each lecture. Students are expected to read the material before coming to class.

There will be four assignments:

- Essay on portrayal of artificial intelligence in a literary or audio-visual work
- Game playing

- Logic and Knowledge engineering
- Machine learning

The detailed requirements for these assignments will be announced on the course web site. Late submission penalty is 10% of the grade per day.

Ethics

The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful, abiding by the *Computer Science Academic Integrity Policy*:

Cheating is wrong. Cheating hurts our community by undermining academic integrity, creating mistrust, and fostering unfair competition. The university will punish cheaters with failure on an assignment, failure in a course, permanent transcript notation, suspension, and/or expulsion. Offenses may be reported to medical, law or other professional or graduate schools when a cheater applies.

Violations can include cheating on exams, plagiarism, reuse of assignments without permission, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition. Ignorance of these rules is not an excuse.

Academic honesty is required in all work you submit to be graded. Except where the instructor specifies group work, you must solve all homework and programming assignments without the help of others. For example, you must not look at anyone else's solutions (including program code) to your homework problems. However, you may discuss assignment specifications (not solutions) with others to be sure you understand what is required by the assignment.

If your instructor permits using fragments of source code from outside sources, such as your textbook or on-line resources, you must properly cite the source. Not citing it constitutes plagiarism. Similarly, your group projects must list everyone who participated.

Falsifying program output or results is prohibited.

Your instructor is free to override parts of this policy for particular assignments. To protect yourself: (1) Ask the instructor if you are not sure what is permissible. (2) Seek help from the instructor, TA or CAs, as you are always encouraged to do, rather than from other students. (3) Cite any questionable sources of help you may have received.

On every exam, you will sign the following pledge: "I agree to complete this exam without unauthorized assistance from any person, materials or device. [Signed and dated]". Your course instructors will let you know where to find copies of old exams, if they are available.

Report any violations you witness to the instructor.

You can find more information about university misconduct policies on the web at these sites:

- Undergraduates: e-catalog.jhu.edu/undergrad-students/student-life-policies/
- Graduate students: e-catalog.jhu.edu/grad-students/graduate-specific-policies/

Students with Disabilities

Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516-4720, studentdisabilityservices@jhu.edu.

ABET Outcomes

- An ability to apply knowledge of computing and mathematics appropriate to the discipline (a)
- An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution (b)

- An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs (c)
- An ability to function effectively on teams to accomplish a common goal (d)
- An understanding of professional, ethical, legal, security and social issues and responsibilities (e)
- An ability to communicate effectively with a range of audiences (f)
- An ability to analyze the local and global impact of computing on individuals, organizations and society (g)
- Recognition of the need for and an ability to engage in continuing professional development (h)
- An ability to use current techniques, skills, and tools necessary for computing practice (i)
- An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices (j)
- An ability to apply design and development principles in the construction of software systems of varying complexity (k)