WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

COMP SCI 540 section 001

Introduction to Artificial Intelligence

COURSE INFORMATION

Introduction to Artificial Intelligence

COMP SCI 540 001 (3 Credits)
2022 Summer [1226]

Description

Principles of knowledge-based search techniques, automatic deduction, knowledge representation using predicate logic, machine learning, probabilistic reasoning. Applications in tasks such as problem solving, data mining, game playing, natural language understanding, computer vision, speech recognition, and robotics. Enroll Info: None

Prerequisite(s)

(COMP SCI 300, 320 or 367) and (MATH 211, 217, 221, or 275) or graduate/professional standing or declared in the Capstone Certificate in Computer Sciences for Professionals

Breadths

N - Natural Science

Instruction Mode

Classroom Instruction

Section Level Com B

False

Department: Computer Sciences
College: Letters and Science

2022 Summer [1226]
Term Start Date: Monday, 16-May-2022 **Term End Date:** Thursday, 15-Sep-2022

ADD TO CALENDAR

Location and Schedule:	Noland Hall 132 TWRF 1:00 PM-2:15 PM
CRN:	464581226

INSTRUCTORS AND TEACHING ASSISTANTS (TAs)

Instructor

Young Wu
✉ YW@CS.WISC.EDU

Instructor Availability and Preferred Contact:

Fridays from 5:30 to 8:30 pm in Ender's Game
Saturdays 12:30 to 2:30 pm in Computer Science
Sundays 12:30 to 2:30 pm in Computer Science

COURSE OUTCOMES, GRADING, and OTHER COURSE MATERIALS

Course Learning Outcomes (CLOs):

- (Uninformed Search Methods) Identify the formulation of search for problem solving tasks. Understand important concepts in uninformed search. Apply the search methods on the formulated search problem.

- (Informed Search Methods) Understand important concepts in informed search. Differentiate from uninformed search. Solve the formulated search problem with the informed search method A*.

- (Local Search Methods) Identify the formulation of search for problem solving tasks. Apply the hill climbing method for local search problems. Identify and summarize the important features of the simulated annealing and genetic algorithms.

- (Game Playing) Recall the concept of games. Perform the minimax game playing method on formulated game tasks. Apply alpha-beta pruning to speed up the minimax method.

- (Unsupervised and Supervised Learning) Identify and summarize important features about supervised learning and unsupervised learning. Differentiate between the two types of tasks.

- (Classic Learning Methods) Apply linear regression, hierarchical agglomerative clustering algorithm, k-means clustering, or K nearest neighbor algorithm on given problem instances. Judge if the method is appropriate for a given task.

- (Neural Networks and Deep Learning) Apply Perceptron learning rule on given problem instances. Implement neural networks using given software packages.

- (Reinforcement Learning) Understand the concepts of reinforcement learning. Identify and summarize its important features. Compute value function and Q function. Apply value iteration and Q learning on given problems.

- Remember algorithms including logistic regression, perceptron, neural network, convolutional network, support vector machine, k-nearest neighbors, decision tree, naïve Bayes, Bayesian network, hierarchical clustering, principal component analysis, uninformed search, informed search, hill climbing, simulated annealing, genetic algorithms, minimax game, and alpha-beta pruning.

- Understand the mathematics and statistics behind algorithms listed in Course Learning Outcome 1.

- Apply the algorithms listed in Course Learning Outcome 1 to specific problems in fields including computer vision, natural language processing, robotics and game theory.

- Analyze the applicability and efficiency of the algorithms listed in Course Learning Outcome 1 for specific problems in fields including computer vision, natural language processing, robotics and game theory.

- Evaluate the correctness and efficiency of the algorithms listed in Course Learning Outcome 1.

- Create and design simple modifications and improvements of prototype of the algorithms listed in Course Learning Outcome 1.

Grading:

Quizzes or Math Homework (2% each week x 10 weeks)
Programming Homework (4% each week x 10 weeks)
Midterm Exam (20%)
Final Exam (20%)

Conversion between percentage grade to letter grade:
90 - 100 : A
85 - 89 : AB
80 - 84 : B
75 - 79 : BC
70 - 74 : C
60 - 69 : D
0 - 59 : F

Midterm and final exam grades will be curved by dropping the questions which significant proportion of the students

cannot answer correctly. The students who answered those correctly keep the points as bonus points.
Quiz and homework grades will not be curved.
The final grade will not be curved.

Attendance and participation is part of the grading through the weekly quizzes during the lectures.

Discussion Sessions:

There are no discussion sessions.

Laboratory Sessions:

There are no lab sessions.

Required Textbook, Software, & Other Course Materials:

Optional textbooks: (SS) Understanding Machine Learning: From Theory to Algorithms by Shai Shalev-Schwartz and Shai Ben-David and (RN) Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.

Required software tools: Java, Python or Matlab.

Homework & Other Assignments:

Rules for homework:
Students must be present during the lectures to participate in the quizzes.
Students must indicate whether their math homework is incomplete in the comments.
Students cannot submit code written by other students or the course staff, or found online as part of their programming homework.
Students cannot submit output produced by other students as part of their programming homework.

Quizzes are submitted through Socrative.
Math homework and programming homework are submitted through Canvas.

EXAMS, QUIZZES, PAPERS & OTHER MAJOR GRADED WORK

Exams, Quizzes, Papers & Other Major Graded Work:

Math homework and programming homework are due the Sunday after they are assigned.
Programming homework can be submitted without penalty two weeks after the due date.

The midterm exam is on July 11, in-class, closed book, with the alternative date July 16.
The final exam is on August 15, in-class, non-cumulative, closed book, with the alternative date August 20.

ADDITIONAL COURSE INFORMATION AND ACADEMIC POLICIES

Syllabus Statements

https://guide.wisc.edu/courses/#SyllabusStatements