CSC 158/270: Artificial Intelligence
Spring 2018
Classes: MW 2:55 to 4:20, Adams 203

Instructor: Dr. Simona Doboli
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Office Hours: M: 9:30 - 11:00, T: 11:10 - 12:10, T: 4:00 - 4:30

Prerequisites: CSC 17: Topics (very well): Data Structures and Algorithms, comfortable programming in a high-level language.

Text Book: *Introduction to Artificial Intelligence, W. Ertel, 2011, Springer.*
Recommended: *Artificial Intelligence, A modern approach, Rusell and Norvig, 3rd edition* - The most used textbook for AI courses.
              Programming Collective Intelligence, Toby Segaran, O'Reilly, 2007.

Bulletin description:

> Survey of concepts and problems of computers performing tasks which traditionally require human intelligence. Topics include heuristic search and robotics, pattern recognition, game playing, theorem proving, question-answer systems and natural language processing. *Prerequisite:* CSC 17

Course Topics:

1. What is AI?
2. Uninformed search overview
3. Informed search: A* search
4. Heuristic Search Algorithms
5. Search algorithms for games.
6. Search algorithms for constraint satisfaction problems
7. Knowledge representation: propositional logic, first order logic, inference in first order logic, semantic networks.
8. Genetic Algorithms
9. Neural Networks: artificial neural networks.
10. Reinforcement learning
11. Possible additional topics: machine learning (clustering, classification, ranking, decision trees)

Course Goals:

1. Select an appropriate search algorithms for a given problem/game.

2. Develop and choose an appropriate heuristic for search algorithms for a given problem/game.
3. Implement and test search algorithms in a high-level programming language.
4. Develop and implement search algorithms for constraint satisfaction problems.
5. Develop a logic knowledge representation and apply inference algorithms on it.
6. Make inferences on knowledge represented as Bayesian networks.
7. Develop genetic operators for a particular optimization problem.
8. Implement and genetic algorithms for a particular problem.
9. Train and evaluate feed forward neural networks for a particular classification or learning problem.

Course requirements:

Homework: 4-5 homework assignments, some with heavy programming.

Project 1: Search algorithms and games. Work can be done individually or in groups of two. A project report is due.

Project 2: You can choose a topic and problem of your interest. I expect you to read a couple of papers, to do an implementation (program). A project report and presentation are due. The project can be done individually or in groups of two.

The project report will contain: (1) *Abstract* (a few sentences on what the project is about), (2) *Introduction* (What is the problem, what are the main issues, what is the solution chosen and why), (3) *Problem definition* (a formal definition of the problem), (4) *Methods* (a detailed solution (e.g. algorithm)), (5) *Results*, (6) *Conclusions and Discussions* (discuss the results, compare them with those obtained with other methods, discuss the advantages and limitations of your solution), and (7) *References*.

Exams: Midterm, and final exam. All exams have to be taken ONLY at the day and time they are offered. Only university approved excuses will be accepted.

News flash: Each week on Monday for 15 minutes we will discuss a topic in current trends in AI (from news or articles). You have to submit a short description of it on the discussion board on Blackboard. You need to submit at least 2 submissions over the course of the semester.

A submission needs to include: (a) a link to the web-site, (b) a short description of the AI method, description of the application, overview of the results, advantages and shortcomings over other methods.

At least one submission must be from a research article. You can use: **Hofstra library on-line databases: IEEE CS digital library, ACM digital library.**

Grading policy:

Homework:	20 %
Quizzes:	5 %
News Flash:	5 %
Project 1:	20 %
Project 2:	20 %
Midterm:	20 %
Final:	15 %

The course cannot be passed without any of the following: 70% of the homework completed on time and passing grades for the two projects and for the final exam.

Weekly Schedule

Week	Lecture	Assignment
1	AI history Uninformed search algorithms: Breath and depth search first, DLS, IDS, Uniform cost search.	Read Turing paper HW 1
2	Informed search algorithms: greedy, A*, local search (hill-climbing). Constraint Satisfaction Problems	HW 2
3	Min-max, alpha-beta pruning	HW 3, Project 1: search
4-5	Logical thinking: propositional logic, Horn Clauses, Prolog Midterm	HW 4
6-7	Bayesian networks Presentation Project 1	HW 5, Project 1 report due
8	Neural Networks	
9	Genetic algorithms	
10-13	Machine learning 11-13	Project 2:
14	Presentation Project 2	Project 2 report due
Final	Final Exam	

Collaboration policies for assignments and projects

1. Assignments must be written individually.
2. Copying code off the Internet is not considered your work and it will have the same outcome as copying from a colleague.
3. You are encouraged to discuss assignments among you. But each student has to write his/her own implementation.

4. You have to acknowledge in writing, at the beginning of your assignment, what kind of help you used (e.g. help with this solution, etc.) and the exact source of the help (tutor in labs, other students, web pages, etc.). Even if you did your homework alone, please write a statement stating this on your first page of the assignment and sign it. But, be careful, you cannot ask for help or receive help for code writing, only for coming up with a solution.

Exam Policy:

All exams have to be taken ONLY at the day and time they are offered. Only University approved excuses that are properly documented will be accepted and only if they are announced at least one week before the exam day.

Disabilities Policy

If you believe you need accommodations for a disability, please contact Services for Students with Disabilities (SSD). In accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, qualified individuals with disabilities will not be discriminated against in any programs, or services available at Hofstra University. Individuals with disabilities are entitled to accommodations designed to facilitate full access to all programs and services. SSD is responsible for coordinating disability-related accommodations and will provide students with documented disabilities accommodation letters, as appropriate. Since accommodations may require early planning and are not retroactive, please contact SSD as soon as possible. All students are responsible for providing accommodation letters to each instructor and for discussing with him or her the specific accommodations needed and how they can be best implemented in each course.

For more information on services provided by the university and for submission of documentation, please contact the Services for Students with Disabilities, 212 Memorial Hall, 516-463-7075.

Academic Honesty

Plagiarism is a serious ethical and professional infraction. Hofstra's policy on academic honesty reads: "The academic community assumes that work of any kind [...] is done, entirely, and without assistance, by and only for the individual(s) whose name(s) it bears." Please refer to the "Procedure for Handling Violations of Academic Honesty by Undergraduate Students at Hofstra University" to be found at http://www.hofstra.edu/PDF/Senate_FPS_11.pdf , for details about what constitutes plagiarism, and Hofstra's procedures for handling violations.

NOTICE ON CAMPUS SEXUAL ASSAULT AND DISCRIMINATORY HARASSMENT

University policy and federal laws such as Title IX, Title VI and the ADA make it clear that sexual violence and harassment. Based on any protected characteristic are strictly

prohibited and are subject to standards of accountability at the University. If you or someone you know has been sexually assaulted or subjected to discriminatory harassment. The University offers multiple resources to support you and has policies and procedures to address these offences. For more Information, contact the University Title IX coordinator, Jean Peden-Christodolou, at 516-463-6815, Jean.C.PedenChristodoulou@hofstra.edu; the University Equal Rights % Opportunity Officer, Jennifer Mone, at 516-463-1800, eroo@hofstra.edu; or refer to the applicable University policy at www.hofstra.edu/eoe.