CMSC 289I: Rise of the Machines - Fall 2016

Time and Place: Tuesdays and Thursdays, 2:00 pm – 3:15 pm, CSI 2117

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Teaching Assistants: Josh Brule, 301-405-2775, jbrule@cs.umd.edu
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Office Hours: as below or by appointment; all TA Office Hours are in AVW Room 1112

Mon.	10:30 – 11:30 am	Josh Brule
Tues.	10:30 – 11:30 am	Josh Brule
	5:00 – 6:00 pm	Gavin Watson
Weds.	3:00 – 4:00 pm	Gavin Watson
Thurs:	3:15 – 4:15 pm	Jim Reggia

Class web page: http://www.cs.umd.edu/class/fall2016/cmsc289I
Exam dates, homework and its due dates, lecture slides, readings, links to other information.

Objectives: The primary objectives of this course are:

1. to describe the current state and future prospects of machine intelligence;
2. to survey major past approaches to creating machine intelligence; and
3. to provide hands-on experience using some basic AI and artificial life software and concepts.

Course Content:

The central question in this course is "Can a machine be intelligent, and if so, is that dangerous?" We examine major concepts from artificial intelligence (AI) at an introductory level, including how contemporary AI systems work under the surface and how that differs from AI as portrayed in science fiction literature and film. We consider the different methods used over the last half century in attempting to create an intelligent machine, along with their successes and failures. While the central framework of the course is computer science, there is substantial multi-disciplinary content, taken from neuroscience, psychology, biology, and philosophy. Topics include:

The Great AI Debate. Can a machine think? What does "think" mean in this context? Is it useful or dangerous to create an intelligent machine? What methods are used to create AI systems? What are the implications of combining AI with robotics? The history of AI and this debate.

Programmed AI. The fundamental nature of symbolic computation and the concept of an algorithm; Lisp and Prolog; methods for representing data and procedures in a machine; search for solving problems and playing games; automated reasoning; knowledge representation and acquisition; dealing with uncertainty; natural language processing; machine learning.

Brain-Inspired AI. Brain organization, information representation and processing in biological neural networks, artificial neural networks, self-organization and emergence of intelligence in neural networks, pattern recognition, control of movements and behavior, neural networks in machine learning (perceptrons, error backpropagation, Hebbian learning).

To Infinity, and Beyond …

Artificial Minds: cognitive science; symbolic models of memory and cognition based on if-then rules, semantic nets, and causal nets; human and machine consciousness.
Cognitive robotics: planning, learning procedures.
Creativity: its nature, and can a machine evolve to possess it?
Swarm Intelligence: emergence, dynamical systems, artificial life, self-assembly, L-systems.

The Great AI Debate (revisited). We re-examine the question of whether machines can think in the context of the technical material above, discuss potential implications of AI for human society, and examine contemporary issues such as machine free will, human-machine hybrids, quantum computing and the technological singularity. What does the future hold?

Workload and Grading: There will be regular reading and homework assignments, and worksheets completed during class. Some assignments will include conducting online experiments using existing AI software, such as performing a simulated Turing Test, or using machine learning and neural network software. Grading will be based on homework assignments, worksheets and class participation (collectively 30%), a midterm exam (30%), and a final exam (40%).

Needed Background in Computing and Math: While there is substantial technical material presented in this course, our goal is to make the information covered as accessible as possible to a broad range of undergraduate students. Accordingly, no prior knowledge of computer programming is needed. We assume that you know how to use a computer with Windows, OS/X, or Linux as an operating system. You also need to know how to use a web browser, how to read/send email, how to download a file, and how to edit and save a text file. High school algebra and a basic understanding of concepts such as probabilities are assumed.

Required Textbooks:

Introduction to Artificial Intelligence, Wolfgang Ertel, paperback, Springer, 2011, ISBN: 9780857292988. An eBook pdf version is available free of charge via the campus library at http://dx.doi.org/10.1007/978-0-85729-299-5, but you may need to go to the library's online catalog and then login with your campus id and password to obtain access to the eBook version.

Minds and Computers, Matt Carter, paperback, Edinburgh University Press, 2007, ISBN: 9780748620999.

Class Absence Policy: The campus has an established policy governing class absences. This policy requires instructors to provide the following information. For CMSC 289I, the "major scheduled grading events" are the midterm and final exams. A maximum of one self-signed medical excuse for other grading events will be accepted.

Campus Course Policies: See http://www.ugst.umd.edu/courserelatedpolicies.html

Electronic devices: Laptops, tablets, cell phones and other electronic devices are required to be off/silenced during class unless specifically directed otherwise by the instructor.

Disabilities: Any student eligible for and requesting reasonable academic accommodations due to a disability needs to provide the instructor with a letter of accommodation from the Office of Disability Support Services (DSS) within the first two weeks of the semester.

Academic Integrity: All homework assignments are to be done individually and independently; all submitted work must be your own. All students are expected to be familiar with and to uphold the Code of Academic Integrity administered by the Student Honor Council at UMCP (please see http://www.shc.umd.edu).