



COMP-4475-WDE Topics Artificial Intelligence

Winter 2023 Jan 9 - Apr 11

Course Number:	COMP4475 WDE
Course Name:	Topics in Artificial Intelligence
Course Category:	Professional Course for undergraduate students in Computer Science
Credit:	0.5
Period:	24 lecturers
Instructor:	TBD
Email:	TBA
Department:	Science & Environmental Studies/ Department of Computer Science
Grading:	Project 30% Midterm Exam 30% Final Exam 40%
Class Time:	MW 10:00AM-11:30AM
Office Hour:	TBA

Late Penalty: Late assignments/reports will be deducted 10% per day up to 3 days (after which they will receive 0 marks).

Plagiarism: is forbidden.

Prerequisite: Students will need a functional knowledge of calculus, differential equations, linear algebra, set and logic, Probability and statistics, and Automata and languages etc.

Course Description: This course provides an introduction to elements of Artificial intelligence (AI). AI is a research field that studies how to realize the intelligent human behaviors on a computer. The main focus will be on techniques to make a computer that can learn, plan, and solve problems autonomously. The main research topics in AI include problem-solving, knowledge representation, logic, reasoning, learning, optimization and training of data, fuzzy logic inference systems, artificial neural networks, genetic algorithms, natural language understanding, and machine learning, and so on. And these topics are closely related with each other. For example, the knowledge acquired through learning can be used both for problem solving and for reasoning. In fact, the skill for problem solving itself should be acquired through learning. Also, methods for problem solving are useful both for reasoning and planning. Further, both



natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition.

In this course, the most fundamental knowledge for understanding AI will be studied and some basic models and algorithms related to AI will be introduced.

Course Objectives:

The objective of this course is to provide the most fundamental knowledge of AI theory and technologies so that students will understand classical and modern AI algorithms and applications. The fundamental analysis and design of common-used AI algorithms will be introduced in this course, mainly including logic and reasoning, optimization and training of data, neural networks, machine learning, fuzzy logic inference systems, search, genetic algorithms, ontology, knowledge graph, natural language processing, etc. Due to limited time, we will try to eliminate theoretic proofs and formal notations as far as possible, so that the students can get the full picture of AI easily. Students who become interested in AI may go on to the further study and potential of AI in research and real-world environments.

Suggested References:

1. Soft Computing and Intelligent Systems Design: Theory, Tools, and Applications, F. Karray, C. deSilver, Pearson Publishing Inc., 2004
2. Artificial Intelligence: A Modern Approach (4th edition) by Stuart Russell and Peter Norvig, Pearson, 2021
3. Artificial Intelligence for Human Volume 1-6, Jeff Heaton, 2013
4. Artificial Intelligence-With an Introduction to Machine Learning by Richard E. Neapolitan and Xia Jiang, CRC Press, 2018



Suggested References:

5. Soft Computing and Int
Course Syllabus:

Week	Lesson	Content	Assignment
First	1	Course Logistics Chapter 1 Artificial Intelligence overview §1.1-1.3	
	2	Chapter 2 Basic Mathematics for AI §1.4; §2.1-2.4	Example 2.1
Second	3	Chapter 2 Basic Mathematics for AI §2.5-2.6 Chapter 3 Fundamental AI Algorithms §3.1	Excises-C2
	4	Chapter 3 Fundamental AI Algorithms §3.2-3.4	Examples 3.1, 3.2
Third	5	Chapter 3 Fundamental AI Algorithms §3.5 Chapter 4 Fuzzy Logic and Fuzzy Reasoning §4.1-4.2	Examples 4.1, 4.2 Excises-C3
	6	Chapter 4 §4.3 Fuzzy Logic Operations	Examples 4.4 - 4.6
Fourth	7	§4.3 Fuzzy Logic Operations (cont.) Fuzzy implication operation and examples	Example 4.7
	8	Chapter 4 §4.4 Fuzzy relation	Examples 4.8 - 4.10

Fifth
Sixth
Seventh
Eighth
Ninth
Tenth

Eleventh	21	Chapter 6 §6.2 Knowledge representation and processing: Semantic Technologies & KR	
	22	Chapter 6 §6.2 Knowledge representation and processing: Concept, Ontology, Triples, Knowledge Graph	
Twelfth	23	Chapter 6 §6.3 Natural language understanding and processing	Excises-C6
	24	Midterm solutions and review chapter 1 to 6 for final exam	

Important notification

- **Project Report due: TBA**
- **Final Exam: TBA**