澳門理工大學
Universidade Politécnica de Macau
Macao Polytechnic University

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN ARTIFICIAL INTELLIGENCE

LEARNING MODULE OUTLINE

Academic Year	2024/2025	Semester	1
Module Code	CSAI2122		
Learning Module	Introduction to Artificial Intelligence		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Yapeng Wang	Email	yapengwang@mpu.edu.mo
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MODULE DESCRIPTION

The learning module introduces both the theoretical and the practical aspects of artificial intelligence (AI), you will learn the foundational principles that drive these applications and practice implementing some of these systems. The topics include mathematical logic, searching heuristics, Markov Decision Processes, Game Playing, Bayesian inference, machine learning. These topics cover a wide range of key topics in modern AI, from deterministic reasoning to reasoning with uncertainty, from rule-based systems to learning-based systems, etc. The main goal of the module is to equip you with the tools to tackle new AI problems you might encounter in life.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Summarize and apply fundamental mathematical models in AI; (C1)
M2.	Convert and solve practical problems by fundamental AI techniques; (C1, C2)
M3.	Illustrate and analyze high level concerns of AI, such as inference and learning; (C2, C3)
M4.	Evaluate and compare different AI algorithms in practical applications; (C1, C3)
M5.	Design and apply AI techniques into real world problem solving. (C1, C5, C8)

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs		**M1**	**M2**	**M3**	**M4**	**M5**
P1.	Select and apply proven methods, tools and techniques to the effective and efficient implementation of information systems on common platforms, including the Internet platform.	✓				
P2.	Acquire essential knowledge in specific fields of artificial intelligence, including machine learning, computer vision and natural language processing.		✓			
P3.	Apply necessary mathematical techniques to model, analyse and devise solutions to complex problems.			✓		✓
P4.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support and mitigation of security risks of computer systems and networks.					
P5.	Design and implement both relational and non-relational data stores, with an emphasis on how to organise, maintain, retrieve and analyse information.					
P6.	Distinguish the fundamental and operational issues of computer systems and artificial intelligence applications, with considerations of user, business, ethical, societal and environmental needs.					
P7.	Evaluate, prepare and communicate effectively on technical information to both technical and non-technical audience.				✓	
P8.	Work as an effective member of a team in the analysis, design and development of software systems, with recognition of requirement to support equality, diversity and inclusion.					
P9.	Use project planning, risk management and quality management techniques in solutions to complex problems.					
P10.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own.					

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1-2	1. Introduction	6
	1.1 What is computer science	
	1.2 What is artificial intelligence	
	1.3 Relationship between CS and AI	
	1.4 State-of-the-art in AI	
	1.5 Ethical issues of AI	
3-4	2. Mathematical Logic	6
	2.1. Propositional logic	
	2.2 First-order logic	
	2.3 Inference	
5-6	3. Search Heuristics	6
	3.1 Graph	
	3.2 State space search	
	3.3 DFS and BFS	
	3.4 A* search	
	3.5 Applications	
7-8	4. Markov Decision Processes	6
	4.1. MDPs, policy evaluation, value iteration	
	4.2. Reinforcement learning	
	4.3. Monte Carlo, SARSA, Q-learning	
	4.4. Exploration/exploitation, function approximation	
9-10	5. Game Playing	6
	5.1. Minimax, expectimax	
	5.2. Evaluation functions	
	5.3. Alpha-beta pruning	
	5.4. TD learning	
	5.5. Game theory	

11-12	6. Bayesian Inference	6
	6.1. Conditional probability and Bayes theorem	
	6.2 Bayes reasoning	
	6.3 Bayes networks	
	6.4 Case study	
13-15	7. Machine Learning	9
	7.1 From rule-based to learning systems	
	7.2 Unsupervised learning	
	7.3 Supervised learning	
	7.4 Semi-supervised learning	

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	**M1**	**M2**	**M3**	**M4**	**M5**
T1. Lectures	✓				
T2. Case studies		✓	✓	✓	✓
T3. In-class practice		✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	**Weighting (%)**	**AHEP4 LOs**	**ILOs to be Assessed**
A1. Assignments	25%	C1, C2, C5, C8	M2, M3, M4, M5
A2. Test	25%	C1, C2, C3	M1, M2, M3
A3. Examination	50%	C1, C2, C3	M1, M2, M3

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

Students with an overall score of less than 35 in the coursework must take the re-sit examination even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination must take the re-sit examination even if the overall score for the module is 50 or above.

Students with an overall final grade of less than 35 are NOT allowed to take the re-sit examination.

REQUIRED READINGS

Textbook(s)

1. Stuart Russell (2020). *Artificial Intelligence: A Modern Approach (4th ed.)* Pearson.

REFERENCES

1. Judea Pearl (1988). *Probabilistic Reasoning in Intelligent Systems: Networks of Plausible Inference (1st ed.)* Morgan Kaufmann.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.