FACULTY OF APPLIED SCIENCES
BACHELOR OF SCIENCE IN ARTIFICIAL INTELLIGENCE
LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	2
Module Code	CSAI2122		
Learning Module	Introduction to Artificial Intelligence		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
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MODULE DESCRIPTION

The objectives of this module are to provide a comprehensive understanding of computer science and its relationship with artificial intelligence (AI), machine learning (ML), and deep learning (DL). Students will explore foundational concepts and state-of-the-art advancements in AI, as well as ethical issues related to its application. The module will cover reflex-based models through machine learning techniques, including unsupervised, supervised, and semi-supervised learning. Additionally, students will delve into variables-based models, focusing on deep learning architectures such as Multilayer Perceptron (MLP) and Convolutional Neural Networks (CNNs). The curriculum will also address states-based models and search heuristics, including graph theory, state space search, and swarm intelligence algorithms. Furthermore, students will gain insights into Bayesian inference, conditional probability, and Bayes networks, supplemented by practical case studies. Finally, the module will examine various applications of AI, including computer vision, speech interaction, natural language understanding, expert systems, and robotics, equipping students with the necessary skills to tackle real-world AI challenges.

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, machine learning, and deep learning	
	1.3 Relationships among CS, AI, ML, and DL	
	1.4 State-of-the-art in AI	
	1.5 Ethical issues of AI	
3-7	2. Reflex-based models: Machine Learning	15
	2.1 From rule-based to learning systems	
	2.2 Unsupervised learning	
	2.3 Supervised learning	
	2.4 Semi-supervised learning	
8-9	3. Variables-based models: Deep learning	6
	3.1 Multilayer Perceptron (MLP)	
	3.2 Convolutional neural networks (CNNs)	
	3.3 More advanced AI techniques	
10-11	4. States-based models: Search Heuristics	6
	4.1 Graph	
	4.2 State space search	
	4.3 DFS, BFS, and A* search	
	4.4 Swarm Intelligence Algorithm	
	4.5 Applications	
12-13	5. Variables-based models: Bayesian Inference	6
	5.1. Conditional probability and Bayes theorem	
	5.2 Bayes reasoning	
	5.3 Bayes networks	
	5.4 Case study	
14-15	8. Applications of AI	6

	8.1 Computer vision	
	8.2 Speech interaction	
	8.3 Natural language understanding	
	8.4 Expert system	
	8.5 Robotics	

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. Assignment	20%	C1, C2, C5, C8	M2 M3 M4 M5
A2. Assignment	20%	C1, C2, C5, C8	M2 M3 M4 M5
A3. Test	20%	C1, C2, C3	M1 M2 M3
A4. Examination	40%	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.
2. Aurélien Géron (2019) Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent (3rd ed.) O'Reilly Media.

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/.