FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE IN COMPUTING

LEARNING MODULE OUTLINE

Academic Year	2023/2024	Semester	2
Module Code	COMP421		
Learning Module	Artificial Intelligence		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Yue Sun	Email	yuesun@mpu.edu.mo
Office	Rm. N46B, Wui Chi Building	Office Phone	8599 6889

MODULE DESCRIPTION

The learning module introduces both the theoretical and the practical aspects of artificial intelligence (AI), including the fundamental mathematical models and the state-of-the-art tools for AI problem solving. The topics include mathematical logic, searching heuristics, Bayesian inference, machine learning and PyTorch programming language. 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.

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 (SM2p, EA2p);
M2.	Convert and solve practical problems by fundamental AI techniques (EA2p, EA3p);
M3.	Illustrate and analyse high level concerns of AI, such as inference and learning (SM2p);
M4.	Evaluate and compare different AI models in practical applications (SM2p, EA2p);
M5.	Design and implement novel applications based on existing AI models (EA3p, D4p).

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;	✓	✓			
P2.	Evaluate computer systems in a local area network, and understand the additional requirements for connection to other networks through wide area networks;					

P3.	Be competent in system development in the Internet and the web platform;					
P4.	Work independently to design and implement a relational database, with an emphasis on how to organise, maintain and retrieve information from a DBMS;					
P5.	Acquire essential knowledge in specific fields of computing disciplines including multimedia, security and artificial intelligence;	✓		✓		
P6.	Acquire the perceptive skills needed to understand information presented in the form of UML diagram, flow chart or other industry standard formats;					
P7.	Understand the need for and use of the necessary mathematical techniques;		✓			
P8.	Work independently to develop an understanding of, and the knowledge and skills associated with the general support of computer systems and networks;				✓	
P9.	Work as an effective member of a team in the analysis, design and development of software systems;					✓
P10.	Use project planning and management techniques in systems development;					
P11.	Understand the fundamental and operational issues of computer systems in business environments;					
P12.	Equip with adequate written, oral communication and interpersonal skills;					
P13.	Build the capacity and desire for lifelong learning and to learn advanced and emerging technologies on one's own;					✓
P14.	(For Enterprise Information Systems specialization) Gain an in-depth understanding of the information technology related to enterprise information systems, with an emphasis on development of such systems to support business processes;					
P15.	(For Gaming Technology specialization) Acquire the general and advanced knowledge of current technologies and operating environment in the gaming industry;					
P16.	(For Computer Education specialization) Acquire the general and practical knowledge of computer education and its practicing environment in secondary education.					

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1-2	1. Introduction	3
	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	

	2. Image processing techniques	9
	2.1 Histogram and image enhancing	
	2.2 Filtering	
	2.3 Feature extraction	
	2.4 Object Detection	
	3. Bayesian Inference	9
	3.1 Conditional probability and Bayes theorem	
	3.2 Bayes reasoning	
	3.3 Bayes networks	
	3.4 Examples	
	4. Machine Learning	9
	4.1 From rule-based to learning systems	
	4.2 Unsupervised learning	
	4.3 Supervised learning	
	4.4 Semi-supervised learning	
	5. PyTorch Language	6
	5.1 PyTorch fundamental	
	5.2 PyTroch for CNN	
	5.3 PyTroch for RNN	
	6. Advanced Networks	9
	6.1 Generative Adversarial Nets (GAN)	
	6.2 Cycle GAN	
	6.3 Other techniques	

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. 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 (%)	AHEP3 LOs	ILOs to be Assessed
A1. Assignments	25	SM2p, EA3p, D4p	M2, M3, M5
A2. Test	25	SM2p, EA2p, EA3p	M1, M2, M3
A3. Examination	50	SM2p, EA2p, EA3p	M1, M2, M4

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

Complete course slides will be provided.

REFERENCES

1. Stuart Russell (2016). Artificial Intelligence: A Modern Approach (3rd ed.) Prentice Hall.
2. 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/.