FACULTY OF APPLIED SCIENCES

MASTER OF SCIENCE IN SPORTS TECHNOLOGY AND INNOVATION

LEARNING MODULE OUTLINE

Academic Year	2025/2026	Semester	1
Module Code	COMP6143		
Learning Module	Applied Machine Learning		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45 hrs
Instructor	Dr. Yanming Zhang	Email	ymzhang@mpu.edu.mo
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MODULE DESCRIPTION

Artificial Intelligence (AI) has become deeply integrated into our daily lives, often in ways we may not even realize. At the forefront of AI is Machine Learning (ML), a branch of AI that enables computers to learn and adapt without explicit programming. This module covers some of the key machine learning techniques, including decision tree, neural networks, deep learning, etc. The aim of the module is to equip students with both the theoretical foundation and practical skills to apply these methods across various domains, such as classification, regression, etc.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

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

M1.	Apply the theoretical knowledge and statistics to solve sport-related machine learning problems (AHEP4-M1, AHEP4-M2)
M2.	Develop artificial intelligence techniques and machine learning models, and conduct proper training procedures (AHEP4-M4)
M3.	Evaluate and select proper modelling strategies and be able to apply them to sport-related data (AHEP4-M1, AHEP4-M4)
M4.	Design and evaluate machine learning solutions for a real-world sports-related problem. (AHEP4-M16)

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

PILOs		**M1**	**M2**	**M3**	**M4**
P1.	Acquire essential knowledge in specific fields of sports science, including sports physiology and biomechanics, enabling a comprehensive understanding and evaluation of sports technology solutions to complex problems.	✓			

P2.	Demonstrate a deep understanding of the principles, concepts and advancements in sports technology, encompassing exercise training, sports performance analysis, injury prevention, and rehabilitation.	✓			
P3.	Develop proficiency in applying data science and artificial intelligence techniques and tools such as data analysis, statistical inference, data visualization, and predictive modelling, to sports-related data for actionable insights.		✓		
P4.	Design and integrate innovative sports technologies effectively, considering their potential impact to the environment and the society while providing solutions to complex user, societal, and business needs.				
P5.	Evaluate and select sports technology solutions, taking into account factors such as user requirements, societal implications, safety, privacy issues, and ethical considerations.				
P6.	Develop a global vision on the critical development and new application of sports technology.				
P7.	Collaborate in interdisciplinary teams to address complex sports technology challenges, leveraging diverse perspectives and expertise and be able to critically evaluate team and their own performance.	✓	✓		
P8.	Communicate technically and effectively in both speaking and writing to both technical and non-technical audiences.			✓	
P9.	Have a positive attitude towards society and the environment.				✓
P10.	Uphold high moral standards, professionalism, and a commitment to excellence in life-long learning.				

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	Introduction to Machine Learning	3
	1.1 Background of ML algorithm	
	1.2 What constitutes an ML algorithm?	
	1.3 Supervised learning & unsupervised learning	
2-7	2. Linear regression and logistic regression	18
	2.1 Linear regression	
	2.2 Classification	
	2.3 Optimization	
	2.4 Linear programming	

8-10	3. Neural network	9
	3.1 Neural network basics	
	3.2 Activation functions and error functions	
	3.3 Back propagation networks	
11-15	4. Deep Learning	15
	4.1 Back propagation	
	4.2 Convolutional neural networks	
	4.3 Training deep models	
	4.4 Special training technologies	
	4.5 Machine learning applications	
	4.6 Advanced machine learning approaches	

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**
T1. Class teaching and lecture	✓	✓		✓
T2. Group activity			✓	
T3. Literature review				✓
T4. Tests	✓	✓	✓	

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Master'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. Popup quizzes	25%	AHEP4-M1, AHEP4-M2	M1, M3
A2. Group projects	50%	AHEP4-M1, AHEP4-M16	M1, M3, M4

A3. Assignments	25%	AHEP4-M1, AHEP4-M2 AHEP4-M4	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 will fail the module even if the overall score for the module is 50 or above.

Students with a score of less than 35 in the final examination will fail the module even if the overall score for the module is 50 or above.

REQUIRED READINGS

None

REFERENCES

1. Shai Shalev-Shwartz and Shai Ben-David (2014). Understanding Machine Learning: From Theory to Algorithms. Cambridge University Press.
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville (2016). Deep Learning. An MIT Press book, http://www.deeplearningbook.org.
3. Bishop, Christopher M. (2006). Pattern recognition and machine learning. New York: Springer. https://link.springer.com/book/9780387310732

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/.