



Faculty: Information Technology	
Department: Data Science and Artificial Intelligence	Program: Bachelor
Academic year:	Semester:

Course Plan

First: Course Information

Course No.: 1505320	Course Title: <i>Advanced Machine Learning</i>	Credit Hours: 3	Theoretical: 3	Practical: 0
Prerequisite No. and Title: 1505311 <i>Machine Learning /0300103 Statistics and Probabilities</i>		Section No.: 3	Lecture Time:	
Level in JNQF	7			
Type Of Course:	<input type="checkbox"/> <i>Obligatory University Requirement</i> <input type="checkbox"/> <i>Elective University Requirement</i> <input type="checkbox"/> <i>Obligatory Faculty Requirement</i> <input type="checkbox"/> <i>Elective Faculty Requirement</i> <input checked="" type="checkbox"/> <i>Obligatory Specialization Requirement</i> <input type="checkbox"/> <i>Elective Specialization Requirement</i> <input type="checkbox"/> <i>Ancillary course</i>			
Type of Learning:	<input type="checkbox"/> <i>Face-to-Face Learning</i> <input checked="" type="checkbox"/> <i>Blended Learning (2 Face-to-Face + 1 Asynchronous)</i> <input type="checkbox"/> <i>Online Learning (2 Synchronous+ 1 Asynchronous)</i>			

Second: Instructor's Information

Course Coordinator:					
Name:		Academic Rank:			
Office Number:		Extension Number:	Email:		
Course Instructor					
Name:		Academic Rank:			
Office Number:		Extension Number:	Email:		
Office Hours:	<i>Sunday</i>	<i>Monday</i>	<i>Tuesday</i>	<i>Wednesday</i>	<i>Thursday</i>

Third: Course Description

This course intends to extend the basic knowledge and skills that have been introduced in the introduction to machine learning course. The main objective of this course is to provide students with extensive knowledge of unsupervised learning, semi-supervised learning, and reinforcement learning. Moreover, this course introduces three significant data analysis tools which are they: KEEL, WEKA, and Orange.

Fourth: Course Objectives

1. Introducing the student to the fundamental concepts of unsupervised learning, semi-supervised learning, reinforcement learning.
2. Developing the student's ability to analyze unlabeled datasets.
3. Expanding the student's skills of analyzing unlabeled datasets and perform several main tasks such as association, clustering, discretization, and feature selection.
4. Providing the student with the skills of utilizing several data analysis tools such as KEEL, Orange, and WEKA.

Fifth: Learning Outcomes

<i>Level descriptor according to (JNQF)</i>	<i>CILOs Code</i>	<i>CILOs</i> If any CLO will not be assessed in the course, mark NA.	<i>Associated PILOs Code</i> Choose one PILO for each CILO*	<i>Assessment method</i> Choose at least two methods
Knowledge	K1	Outline the main types of learning in machine learning.	PK1	<ul style="list-style-type: none"> • Mid-term Exam • Final Exam
	K2	Identify the main machine learning unsupervised tasks such as association analysis and clustering.	PK2	<ul style="list-style-type: none"> • Mid-term Exam • Final Exam
	K3	Describe the main data analysis tools used in the domain of machine learning.	PK4	<ul style="list-style-type: none"> • Mid-term Exam • Final Exam • Quizzes
Skills	S1	Improve The ability to analyze unsupervised datasets.	PS1	<ul style="list-style-type: none"> • Mid-term Exam • Final Exam
	S2	Choose the best tool to handle a given problem.	PS2	<ul style="list-style-type: none"> • Mid-term Exam • Final Exam
	S3	Improve the quality of the data by performing the required pre-processing steps.	PS2	<ul style="list-style-type: none"> • Mid-term Exam • Final Exam
	S4	Solving real-world problem through the main steps of the scientific research.	PS3	<ul style="list-style-type: none"> • Quizzes • Mid-term Exam • Final Exam
Competencies	C1	Develop effective communication skills needed for group collaboration.	PC1	<ul style="list-style-type: none"> • Course project and participation

*CILOs: Course Intended Learning Outcomes; PILOs: Program Intended Learning Outcomes; For each CILO, the PILO could be the same or different.

Sixth: Learning Resources

Main Reference:	<i>Understanding Machine Learning: From Theory to Algorithms</i>		
Author: Shai Shalev-Shwartz and Shai Ben-David	Issue No.: 2 nd	Print: 2014	Publication Year: 2014
Additional Sources and Websites:			
Teaching Type:	<input checked="" type="checkbox"/> Classroom <input type="checkbox"/> Laboratory <input type="checkbox"/> Workshop <input checked="" type="checkbox"/> MS Teams <input checked="" type="checkbox"/> Moodle		

Seventh: Course Structure

Lecture Date	Course Intended Teaching Outcomes (CILOs)	Topics	Teaching Procedures *	Teaching Methods**	References***
Week 1	--- K1	Course Syllabus Discussion	Face-to-Face	Lecture, In-class Questions	Moodle
		Revision	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2	Revision	asynchronous	Video	YouTube
Week 2	K3, S4 K3, S4	Supervised learning special topic: Multi Label Ranking	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Label Ranking	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K3, S2, S4	Multi Label Classification	asynchronous	Video	YouTube
Week 3	K1, K2, S1, S3, S4 K1, K3, S1, S3, S4	Problem Transformation Methods	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Algorithm Adaptation Methods	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K1, K3, S1, S3, S4	Evaluation metrics for Multi Label Classification	asynchronous	Quiz	Moodle
Week 4	K3, S4 K3, S4	Introduction to Association Analysis	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Apriori Algorithm	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K3, S4	Predictive Apriori Algorithm	asynchronous	Video	YouTube
Week 5	K3, S1, S4	FP-growth Algorithm	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K3, S1, S4	Applications of Association analysis	asynchronous	Self-reading	Internet
Week 6	K3, S1, S4 K3, S1, S4	WEKA tutorial	Face-to-Face	Lecture, In-class Questions	Lecture notes
		WEKA tutorial	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K3, S1, S4	WEKA tutorial	asynchronous	Self-reading	Internet

Week 7	K3, S1, S4 K3, S4	Introduction to Clustering	Face-to-Face	Lecture, In-class Questions	Lecture notes
		K-means Algorithm	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S1, S2, S4	K-means Algorithm	asynchronous	Self-reading	Internet
Week 8	K2, S1, S2	Hierarchical Clustering Algorithms	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S1, S2, S4	Hierarchical Clustering Algorithms	Face-to-Face	Lecture, In-class Questions	Lecture notes
Midterm Exam					
Week 9	K2, S1, S2, S4 K2, S1, S2, S4	KEEL tutorial	Face-to-Face	Lecture, In-class Questions	Lecture notes
		KEEL tutorial	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S1, S2, S4	KEEL tutorial	asynchronous	Video	YouTube
Week 10	K2, S1, S2, S4, K2, S5	Semi-supervised learning	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Semi-supervised learning	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S4	Semi-supervised learning	asynchronous	Quiz	Moodle
Week 11	K2, S1, S2, S4 K2, S1, S2, S4	Introduction to Reinforcement learning	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Application of Reinforcement learning	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S1, S2, S4	Application of Reinforcement learning	asynchronous	Video	YouTube
Week 12	K2, S1, S2, S4 K2, S1, S2, S4	Value-based reinforcement learning.	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Policy-based reinforcement learning.	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S1, S2, S4	Model-based reinforcement learning.	asynchronous	Video	YouTube
Week 13	K2, S1, S2, S4 K2, S1, S2, S4	Orange tutorial	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Orange tutorial	Face-to-Face	Lecture, In-class Questions	Lecture notes
	K2, S3	Orange tutorial	asynchronous	Self-reading	Internet
Week 14	K1, K2, K3, S1, S2, S3, S4	Revision	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Revision	Face-to-Face	Lecture, In-class Questions	Lecture notes
		Revision	asynchronous	Self-reading	Internet
Final Exam					

*Teaching procedures: (Face-to-Face, synchronous, and asynchronous).

** Teaching methods: (Lecture, video....).

*** Reference: (Pages of the book, recorded lecture, video....)

Eighth: Assessment Methods

Methods	Online Learning	Blended Learning	Face-To-Face Learning	Specific Course Output to be assessed							
				**If any CILO will not be assessed in the course, mark NA.							
				K1	K2	K3	S1	S2	S3	S4	C1
First Exam											
Second Exam											
Mid-term Exam		30		✓	✓	✓	✓	✓	✓	✓	
Participation											
Asynchronous Activities		5		✓	✓	✓	✓	✓	✓	✓	
Quizzes		5				✓	✓	✓	✓	✓	
Assignments		5				✓	✓	✓	✓	✓	
Group presentation		5				✓	✓	✓	✓	✓	✓
Final Exam		50		✓	✓	✓	✓	✓	✓	✓	
Total out of 100		100									

Ninth: Course Policies

- All course policies are applied to all teaching patterns (online, blended, and face-to-face Learning) as follows:
 - a. Punctuality.
 - b. Participation and interaction.
 - c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).