هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Machine learning
Course Code:	COMP 442
Program: :	Higher Diploma in Data Science
Department:	Computer Science
College:	Computer Science and Information Technology
Institution:	Jazan University
Version:	V1
Last Revision Date:	15 Feb 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (.....)					
2. Course type					
A.	☐ University	☐College	☒ Department	☐Track	☐Others
B.	☐ Required		☒ Elective		
3. Level/year at which this course is offered: (.....)					
4. Course general Description:					
Machine learning is a sub-field of Artificial Intelligence that gives computers the ability to learn and/or act without being explicitly programmed. Applications of machine learning have permeated many aspects of every-day life and can be found among others in self-driving cars, speech recognition, computer vision, and genomics. Topics include supervised and unsupervised learning (including parametric and non-parametric models, clustering, dimension reduction, deep learning), optimization procedures, and statistical inference.					
5. Pre-requirements for this course (if any)**:**					
Math, statistics and programming					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					
The objective of this course is to teach fundamental methods of machine learning with focus on the theoretical underpinnings, practical implementations, and experimentation. Upon completion of the course students will: 1. Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc. 2. Gain an understanding of the strengths and weaknesses of many popular machine learning approaches.					

3. Uncover the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and unsupervised learning.

4. Be able to design and implement various machine learning algorithms in a range of real- world applications.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	44	80%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning (self Learning)	11	20%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	
2.	**Laboratory/Studio**	
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Understand the main fundamentals that drive Machine	K1	• Lectures/ Presentations • Media Lectures	Assignment-1 Assignment -2 Mid-Term Exam

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	learning and describe the basic principles and concepts of deep learning.			Final Exam
1.2	Explain the architecture and components of supervised and unsupervised and be able to build, train and apply fully connected deep neural networks.	K2	• Lectures/ Presentations • Media Lectures •	Assignment-1 Assignment -2 Mid-Term Exam Final Exam
2.0	**Skills**			
2.1	Implement and code classifiers and clustering using sklearn	S2	• Lectures/ Presentations • Media Lectures • Tutorials • Lab Demonstration	Assignment-1 Mid-Term Exam Final Exam
2.2	Develop proficiency in manipulating and processing data for deep learning tasks.	S3	• Lectures/ Presentations • Media Lectures • Tutorials • Lab Demonstration	Assignment-1 Assignment-2 Final Exam
2.3	Implement machine learning learning models for various types of data (e.g., image, text, time series) and train models.	S1	• Lectures/ Presentations • Media Lectures • Lab Demonstration	Assignment-2 Final Exam
2.4	Use exploratory tools to summarize, visualize and interpret the results.	S2	• Lectures/ Presentations • Media Lectures • Case Studies • Lab Demonstration	Assignment-2 Final Exam
	Justify the machine learning learning model based on the statistical and evaluation metrics		•	

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	**Values, autonomy, and responsibility**			
3.1	Demonstrate the ability to work in a group to achieve common assignments and activities in the machine learning algorithms	V2	• Group Discussion	Assignment-2 (Group Assignment / Group Project)

C. Course Content

No	List of Topics	Contact Hours
1.	**Introduction**	2T+2P
2.	**Logistic and Linear regression**	2T+2P
3	**k-nearest neighbors**	2T+2P
4	**Naive bayes**	2T+2P
5	**Support vector machine**	2T+2P
6	**Ensemble Methods**	2T+2P
7	**Perceptron**	2T+2P
8	**Neural Network**	2T+2P
9	**Other Classifiers: Decision trees, Random Forests, Bagging**	2T+2P
10	**Bias and variances**	2T+2P
11	**Unsupervised learning**	2T+2P
Total		22T+22P

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	**Assignment -1**	**3rd week**	**10%**
2.	**Midterm Exam**	**6th–7th week**	**15%**
3.	**Project**	**9th week**	**20%**
4.	**Lab Exam + Lab Assignment**	**11th week**	**15%**
5.	**Final Theory Exam**	**12th week**	**40%**

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Machine Learning Refined, 2nd Edition, Watt, Borhani, and Katsaggelos
Supportive References	Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig.
Electronic Materials	
Other Learning Materials	Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron Courville.

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom equipped with projector/ smart board, whiteboard, and sufficient seating arrangements. • Lab with software installed and an individual computer terminal for each student.
Technology equipment (projector, smart board, software)	Whiteboards and projectors for lab classroom. The software required for lab work is Python, Tensorflow and Keras.
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
• Effectiveness of teaching	• Students	• Indirect (Course evaluation survey form)
• Effectiveness of • Students assessment	• CRC/QAU/HoD	• Direct (Course reports/ result analysis)
• Quality of learning resources	• Track Leaders/CRC	• Indirect (Review, meetings, and star rating with suggestions for further modifications and improvements)

Assessment Areas/Issues	Assessor	Assessment Methods
• The extent to which CLOs have been achieved	• CRC/QAU	• Direct (CLO assessment template further verified at course coordinator, Track leader and QAU Level)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**DEPARTMENT COUNCIL**
REFERENCE NO.	
DATE	