



Course Specifications

Course Title:	Machine learning
Course Code:	CSI 441
Program:	Computer Science and Information
Department:	Computer Science and Information
College:	College of Science at Az Zulfi
Institution:	Majmaah University

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A. Course Identification

1. Credit hours: (3) (2 Lec + 2 lab)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: elective – 4 th year
4. Pre-requisites for this course (if any): CSI 411
5. Co-requisites for this course (if any): N/A

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	32	80%
2	Blended	4	10%
3	E-learning	0	0%
4	Distance learning	0	0%
5	Other	4	10%

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	20
2	Laboratory/Studio	10
3	Tutorial	10
4	Others (specify)	-
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Machine learning is the science of getting computers to act without being explicitly programmed. This course provides a broad introduction to machine learning. Topics include: (i) Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks). (ii) Unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning). (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI).

2. Course Main Objective

Machine learning is the science of getting computers to act without being explicitly programmed. This course provides a broad introduction to machine learning. Topics include: (i) Supervised learning (parametric/non-parametric algorithms, support vector machines, kernels, neural networks). (ii) Unsupervised learning (clustering, dimensionality

reduction, recommender systems, deep learning). (iii) (iii) Best practices in machine learning (bias/variance theory; innovation process in machine learning and AI).

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Understand the principles, advantages, limitations and possible applications of machine learning.	k1
1.2	Students will have an understanding of basic knowledge about the key algorithms and theory that form the foundation of machine learning and computational intelligence.	k1
1.3	introduce students to the basic concepts and techniques of Machine Learning.	k1
2	Skills :	
2.1	The ability to implement some basic machine learning algorithms.	s1
2.2	Evaluate the strengths and limitations of learning procedures and select an appropriate learning algorithm for a given problem.	s1
2.3	Be able to apply machine learning methods to Quizzes particular target problems and evaluate and report the results appropriately.	s1
2...		
3	Values:	
3.1	Work in a group and learn time management.	c3
3.2	Learn how to search for information through library and internet.	c3
3.3	Communicate with teacher, ask questions, solve problems, and use computers.	c3
3.4	Use Information technology and computer skills to gather information about a selected topic	c3

C. Course Content

No	List of Topics	Contact Hours
1	Types ,What is Machine Learning : Introduction to Machine Learning Face , Classification ,Learning Associations ,of Machine Learning Image Processing. ,Regression Applications ,Recognition	4
2	,Training set X ,Learning a Class from Examples : Supervised Learning Margin VC ,and the Version Space ,G ,S ,Hypothesis class H ,Class C Sample ,Probably Approximately Correct (PAC) Learning ,Dimension Model ,Multiple Classes ,Noise and Model Complexity ,Complexity Selection & Generalization.	4
3	Classification and ,Probabilistic reasoning : Bayesian Decision Theory Utility , Discriminant functions ,Losses and risks ,the MAP Hypothesis Theor	4
4	Maximum Likelihood Estimation Bernoulli : Parametric Methods Evaluating , Gaussian (Normal) Density , Multinomial Density , Density Parametric , The Bayes' Estimator , Bias and Variance :an Estimator Bias/Variance :Tuning Model Complexity, Regression , Classification Model Selection Procedures . , Dilemma	4

5	Estimation of Missing , Parameter Estimation : Multivariate Methods , Multivariate Classification, Multivariate Normal Distribution , Values Multivariate Regression . , Discrete Features , Tuning Complexity	4
6	Principal Components , Subset Selection: Dimensionality Reduction Linear , Multidimensional Scaling , Factor Analysis , Analysis Discriminant Analysis .	4
7	Clustering : Mixture Densities , k-Means Clustering ,Expectation-Maximization Algorithm , Mixtures of Latent Variable Models , Supervised Learning after Clustering ,Hierarchical Clustering ,Choosing the Number of Clusters .	4
8	Using ,Nonparametric density estimation : Nonparametric Methods nonparametric density estimation to do classification.	4
9	Decision Trees : Univariate decision trees, Building classification trees, Dealing with overfitting, Extracting rules from decision trees.	4
10	Geometry of linear ,The basic linear model : Linear Discrimination ,Logistic Discrimination ,Multiple classes ,Two classes ,discrimination Generalizing the linear model with basis functions.	4
Total		

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Understand the principles, advantages, limitations and possible applications of machine learning.	Lectures Lab demonstrations Case studies Individual presentations	Written Exam Homework assignments Class & Lab Activities Quizzes
2.0	Skills		
2.1	The ability to implement some basic machine learning algorithms.	Lectures Lab demonstrations Case studies Individual presentations Brainstorming	Written Exam assignments Lab Activities Quizzes
2.2	Evaluate the strengths and limitations of learning procedures and select an appropriate learning algorithm for a given problem.		
2.3	Be able to apply machine learning methods to Quizzes particular target problems and evaluate and report the results appropriately.		
3.0	Values		
3.1	Work in a group and learn time management.	Small group discussion	Written Exam
3.2	Learn how to search for information through library and internet.	Whole group discussion	Homework assignments Lab
3.3	Communicate with teacher, ask questions, solve problems, and use computers.	Brainstorming Presentation	assignments Class Activities Quizzes

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.4	Use Information technology and computer skills to gather information about a selected topic		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	written mid-term exam	6	20%
2	Presentation ,group discussions ,Class activities	Every 2 weeks	10%
3	Assignments + Homework	After Every chapter	10%
4	Electronic exam	10	10%
5	Lab activities	10	10%
6	Final written exam	12	40%
7			
8			

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

- 6-office hours per week in the lecturer schedule.
- The contact with students by e-mail, mobile, office telephone, website and BlackBoard.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	EthemAlpaydin, Introduction to Machine Learning, ISBN-10: 026201243X ISBN-13: 978- 0262012430, MIT press, 2009.
Essential References Materials	Christopher Bishop, Pattern Recognition and Machine Learning. Springer, 2006.
Electronic Materials	https://www.coursera.org/
Other Learning Materials	Videos and presentations made available on BlackBoard e-Learning platform.

2. Facilities Required

Item	Resources
Accommodation	Classrooms with required digital aids and to support traditional method of teaching using blackboard.

Item	Resources
(Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms with proper lighting and air conditioning system integrated with the sound System /audio system. Classroom with smart board interface, display screen and a computer to aid the sessions
Technology Resources (AV, data show, Smart Board, software, etc.)	Smart Board with supporting software / computers with updated versions of software as required to understand the subject concepts.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	N/A

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Strategies for Obtaining Student Feedback on Effectiveness of Teaching	Instructor	Analysis of students' results. Observation during class work. Students' evaluations. Colleagues' evaluations. Evaluation questionnaire filled by the students. Interview a sample of students enrolled in the course to solicit their opinions
Other Strategies for Evaluation of Teaching	the Department	Self-assessment. External evaluation. Periodic review of course (the Commission of study plans).
Processes for Improvement of Teaching	the Department	Taking into account the recommendations yielded from the internal review of the course. Guidelines about teaching the course provided by the study plans commission. Department guidelines pertaining the faculty member's performance acquired using direct observation. Training and development. Workshops to improve the educational process
Processes for Verifying Standards of Student Achievement	Instructor	check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution. Instructors of the course working together with Head of Department to adopt a unique process of the evaluation.
Describe the planning arrangements for periodically reviewing course	Instructor	Comparison of the course to its counterparts offered in similar departments.

Evaluation Areas/Issues	Evaluators	Evaluation Methods
effectiveness and planning for improvement.		Periodic revision of course description by faculty member. Periodic revision of course description by the study plans and schedules Commission. Update learning resources related to the course to ensure that the course is up-to-date with the developments in the field. Make use of statistical analysis of course evaluation carried out by the students to improve and develop the course. Provide an opportunity to the students to express their opinions about what is taught and receive suggestions and evaluate their effectiveness.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	