COLLEGE OF ENGINEERING
COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

CMPS 460: Machine Learning
Spring 2024

Instructor Information

Name: Dr. Abdelkarim Erradi
Academic Title: Associate Professor
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Phone: 4403-4254
E-mail: erradi@qu.edu.qa
Office Hours: TBD

TA Information

Name: TBD
Office:
Phone:
E-mail:

Class/Laboratory Schedule

  L52 MW 8:00 am - 9:15 am at H07- College of Engineering B240
  L02 MW 9:30 am - 10:45 am at H07- College of Engineering C104

Coordinator Information

Name: Prof. Saeed Mousa Ahmed Salem
Office: H07 - B302, College of Engineering Building
Phone: 4403-4290
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Course Information

Catalog Description: Fundamental principles of machine learning, supervised learning, unsupervised learning, instance-based learning, decision tree induction, Bayesian inference, support vector machines, multi-layer neural networks, and performance evaluation of machine learning algorithms. Hands-on experience with implementing machine learning applications.

Credits: 3 credit hours.

Contact Hours: (3 hour theory, 0 hour lab).

Prerequisites: GENG 200: Probability and Statistics for Engineers, and CMPS 303: Data Structures

Textbook: Mohammed J. Zaki, Wagner Meira, Jr., Data Mining and Machine Learning: Fundamental Concepts and Algorithms, 2nd Edition, Cambridge University Press, March 2020. ISBN: 978-1108473989. Available online here.

References:
- *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow*, 3rd Edition, Aurélien Géron, 2022, O'Reilly Media, Inc., ISBN: 9781098125974.
- *Machine Learning with PyTorch and Scikit-Learn*, Sebastian Raschka, Yuxi (Hayden) Liu, Vahid Mirjalili, 4th Edition, Packt, 2022, ISBN: 9781801819312.
- *Pattern Recognition and Machine Learning*, Bishop C, 2011.
- *Machine Learning*, Mitchell T, McGraw-Hill, 1997

Course Objectives:
Understand and apply existing methods and practices in machine learning to solve problems.

Course Learning Outcomes (CLO):
Upon the successful completion of this course, the students are expected to be able to:
1. Understand the basic theoretical concepts and fundamental principles of machine learning.
2. Compare and contrast various approaches to machine learning.
3. Gain hands-on experience with solving a real-world problem with appropriate machine learning techniques.
4. Design, implement, and analyze machine learning solutions.

Relationship of Course Outcomes to Student Learning Outcomes:

Course Learning Outcomes (CLO)	Related CS Student Outcomes (SO)						Related CE Student Outcomes (SO)						
	1	2	3	4	5	6	1	2	3	4	5	6	7
1	√						√						√
2	√						√					√	
3	√	√				√	√					√	√
4	√	√	√		√	√	√		√		√	√	

CS Student Outcomes (CS-SO)
1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

CE Student Outcomes (CE-SO)
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Topics Covered (tentative):

Week	Topics	Chapters
1	Introduction to Machine Learning	1
2	Working with Data	2, 3, 6, 7
3		
4	Classification Models	18, 19, 20, 21
5		
6	Regression Models	23, 24
7		
8	Artificial Neural Networks	25, 26
9		
10		
11		

12		
13	Clustering	13, 14, 15
14		
15	Project Presentations	

Method of Instruction

The course will be primarily lecture-based.

Assessment Methods and Grading Policy

Assignments: 20% - 5 assignments
Quizzes: 15% - 4 take 3 (no makeups for missed quizzes)
Project & Presentation: 15%
Midterm Exam: 20% - Week 8 (Monday TBD)
Final Exam: 30%

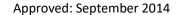## ABET Contribution of Course to Professional Component

Math & Basic Science : 10%
Engineering   : 10%
Computer Science   : 80%
Engineering Design   : 0%
General Education   : 0%

Course Ground Rules Class Participation

- Do not hesitate to ask if you have any question about any of the material discussed during the lecture.
- Course deliverables should be submitted on time and following the given instructions.
- **Attendance:** Attendance is mandatory according to University policies and more than 25% absence will not qualify you for the course credit.
  Keep in mind that late arrival after taking absence will be considered absent for the day.
- **Cheating and/or Plagiarism:** (copying from each other or from other sources, such as the internet) Strict rules will apply in accordance with Qatar University regulations and policies in case of any cheating and/or plagiarism. Check the undergraduate students' handbook for further details on University policies.
- **Blackboard:** Check the course website frequently on Blackboard for updates (e.g. announcements, postings, etc.). All communications must be done through Blackboard.
- **Due Dates:** It is the responsibility of every student to remember all due dates.

Support for Students with Special Needs

It is Qatar University policy to provide educational opportunities that ensure fair, appropriate and reasonable accommodation to students who have disabilities that may affect their ability

to participate in course activities or meet course requirements. Students with disabilities are encouraged to contact their Instructor to ensure that their individual needs are met. The University through its Special Needs Section will exert all efforts to accommodate for individuals' needs.

Contact Information for Special Needs Section:
Tel-Female: (00974) 4403 3843
Tel-Male: (00974) 4403 3854
Location: Student Activities Building
Email: specialneeds@qu.edu.qa

Academic Support and Learning Resources

The University Student Learning Support Center (SLSC) provides academic support services to male and female students at QU. The SLSC is a supportive environment where students can seek assistance with academic coursework, writing assignments, transitioning to college academic life, and other academic issues. SLSC programs include: Peer Tutoring, the Writing Lab, Writing Workshops, and Academic Success Workshops. Students may also seek confidential academic counseling from the professional staff at the Center.

Contact Information for Students Support and Learning Resources:
Tel: (00974) 4403 3876
Fax: (00974) 4403 3871
Location: Female Student Activities Building
E-mail: learningcenter@qu.edu.qa

Student Complaints Policy

Students at Qatar University have the right to pursue complaints related to faculty, staff, and other students. The nature of the complaints may be either academic or non-academic. For more information about the policy and processes related to this policy, you may refer to the student handbook.

Declaration

This syllabus and contents are subject to changes in the event of extenuating circumstances. The instructor (with approval of the Head of Department) reserves the right to make changes as necessary. If changes are necessitated during the term of the course, the students will be notified by email communication and posting the notification on the online teaching tool Blackboard. It is the student's responsibility to check on announcements made while they were absent.

Faculty Name: Prof. Khaled Shaban
Last Modified: 29/01/2023