King Fahd University of Petroleum & Minerals
College of Computing and Mathematics
Computer Engineering Department

COE 292: Introduction to Artificial Intelligence (3-0-3)

Syllabus

Fall Semester 2023/2024 (231)

Introduction

This course is intended to provide an opportunity to learn and develop the necessary knowledge and skills to understand the basic Machine Learning and Artificial Intelligence techniques used to solve real work problems. The course is intended for all KFUPM students in the sophomore level. It is designed as a full semester three credit course that combines all essential elements of enabling students digitally and is the last of the digital enabler courses you will take during your academic career. COE292 class specifically focuses on learning and engaging with fundamental information and tools that will provide you the basis for understanding and applying artificial intelligence techniques in your future carrier.

Class Time and Venue: Click here

Course Catalog Description

Introduction to AI; Uninformed vs. informed search. Constraint satisfaction. Logic and Reasoning pattern; Propositional Logic; Reasoning Patterns. Supervised learning using Nearest Neighbor and SVM. Clustering with mean-shift algorithm. Overview of Neural Networks and training. Overview of deep learning and applications. Feature extraction techniques in Computer Vision. Applications in reinforcement learning.

Course Objectives

The objectives of this course are to:

1. Introduce students to the field of artificial intelligence.
2. Learn a suite of AI tool and their representation.
3. Apply AI tools to model and solve problems.

Course Learning Outcomes

Upon completion of the course, you should be able to:

1. Understand the meaning of AI, its alternative approaches, and the implications of AI for cognitive science more broadly.
2. Understand basic search algorithms and their uses in solving problems.
3. Learn and apply basic AI algorithms, techniques, and representation methods to a variety of real-world problems.

Textbooks and Material

- Lecture Handouts.
- Chowdhary, K.R., Fundamentals of Artificial Intelligence, Springer, 2020. (ISBN 978-81-322-3972-7)
- Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson (Third Edition) 2016.

Assessment Plan

Assessment Tool	Weight	
Attendance	4 %	Check the attendance policy under course policies
Assignments	6 %	Two assignments each worth 3%
Quizzes	10 %	Minimum of 5 quizzes
Midterm Exam	40 %	Tentative Date (Week 8 or 9)
Final Exam	40 %	To Be Announced by the Registrar

Covered Topics:

1. **Introduction to Artificial intelligence**
    a. What is artificial intelligence?
    b. Applications of artificial intelligence.
    c. History of artificial intelligence
2. **Goal Trees and Problem Solving**
    a. Problem Reduction
    b. Understanding goal trees
3. **Knowledge and Reasoning**
    a. Knowledge representation
    b. Propositional logic
    c. Rules of inference
4. **Machine learning**
    a. Supervised learning (KNN, SVM, Perceptron Algorithm)
    b. Unsupervised learning (K-mean)
    c. Reinforcement learning (Q-learning)
5. **Neural Network (NN)**
    a. Artificial Neural Network
    b. Multilevel Perceptron (MLP) as Boolean function
    c. MLP as a universal classifier
    d. NN learning problem.
    e. Gradient Descent
    f. Overfitting and Dropout
6. **Computer Vision**
    a. Image Representation
    b. What is Computer Vision
    c. Computer Vision Applications
    d. Convolutional Neural Networks (CNNs)
7. **Problem Solving by Search**
    a. Uninformed Search (DFS, BFS, UCS)
    b. Informed Search (A* Search)
    c. Adversarial Search (Min-Max Search)
8. **Constraint Satisfying Problem**
    a. Defining Constraint Satisfaction Problems
    b. Real-World Examples of CSPs
    c. Backtracking Search
    d. Improving Backtracking Search

Course Policies

- ***Course Website & Participation***: Students are required to periodically check the course website on the MS Teams and download course material as needed. Several resources will be posted through the website as well. Keys to exams are generally discussed during class as time permits but solutions will not be posted. A common channel on MS Teams will be used for communication and interaction, posting, etc. It is expected that you get benefit of the discussion by raising questions or answering questions put by others. Your active participation and the usefulness of the material you share with other students will be rewarded.
- ***Attendance***: Regular attendance is a university requirement; hence attendance will be taken at the beginning of each lecture. Coming into the class after 5 minutes late will be considered as **'late'**. Each student is expected to attend the class in his registered section unless the class instructor approves otherwise before the scheduled class session.
    - In a three lectures/week format:
        - Missing more than **9 lectures** will result in a DN grade without warning.
        - The first three absences are not penalized. Then, each absence will result in a penalty of 0.5%
        - Three late counts as one absent and will result in a penalty of 0.5%
    - In a two lectures/week format:
        - Missing more than **6 lectures** will result in a DN grade without warning.
        - The first two absences are not penalized. Then, each absence will result in a penalty of 0.75%
        - Two late counts as one absent and will result in a penalty of 0.75%
    - Official excuses must be presented to the instructor no later than one week of returning to classes.
- ***No makeup for tests or quizzes will be given.***
- ***Re-grading policy***: If you have a complaint about any of your grades, discuss it with the instructor no later than a week from distributing the grades (except for the final). Only legitimate concerns on grading should be discussed.
- ***Office Hours***: Students are encouraged to visit faculty in the office hours to clarify any part of the material that is not clear.
- ***Academic honesty***: Students are expected to abide by all the university regulations on academic honesty. **Cheating will be reported to the Department Chairman** and will be severely penalized. Although collaboration and sharing knowledge is highly encouraged, copying others' work (classmates, others or from the web) without proper citation, either in part or full, is considered plagiarism. Whenever in doubt, review the university guidelines or consult the instructor. **Cheating in whatever form will result in an F grade.**
- Absolute academic integrity is expected of every KFUPM student in all academic undertakings. Most essential values academia are grounded on the concept of honesty with respect to the intellectual efforts of oneself and others. While both students and faculty of KFUPM assume the responsibility of maintaining and furthering these values, this memo is concerned specifically with the conduct of students. The KFUPM have a zero-tolerance policy towards cheating, plagiarism or any other violation to the Code of Honesty.
    - Examples of Violations of Code of Academic Honesty
        - Knowingly representing the work of others as one's own.
        - Using, obtaining, or providing unauthorized assistance on examinations, quizzes, assignment, or any other academic work.
    - Examinations.
        - During in-class examinations no student may use, give, or receive any assistance or information not given in the examination or by the proctor.
        - No student may take an examination for another student. The student is responsible for understanding the conditions and rules under which the examination will be taken.
        - Dishonesty or cheating in examinations which is defined as the use of inappropriate or unauthorized materials, information, or study aids in an exam. Unless the instructor directs otherwise, an examination is assumed to be solely a student's own work.
        - No communication is allowed among students either through voice, written, electronic, or any other form of transmission, nor are students permitted to consult books, papers, study aids or notes without explicit permission of the course instructor.
        - Violating exam rules and regulations by bringing smart electronic devices (such as mobile phones, smart watches, earbuds, etc.) to the exam venue is considered a cheating attempt.

Class Time and Venue

Sec.	Time	Venue	Instructor (email)	Office	Office Hours
1	UTR 0800-0850	59-1005	Shujaat Khan (shujaat.khan@kfupm.edu.sa)	22-410-2	
2	UTR 1000-1050	24-236A	Anas Abu Daqa (anas.abudaqa@kfupm.edu.sa)	22-220	U: 9:00 -9:50 am W: 10:00 -11:00 am or by appointment
3	UTR 0900-0950	22-132	Yahya Osais (yosais@kfupm.edu.sa)	22-201	UTR 11-11:50 am
4	UTR 0900-0950	59-1015	Shujaat Khan (shujaat.khan@kfupm.edu.sa)	22-410-2	
5	UTR 1000-1050	24-240-1	Abdulrahman Aliyu (abdulrahman.aliyu@kfupm.edu.sa)		
6	UTR 1000-1050	24-244	Yahya Osais (yosais@kfupm.edu.sa)	22-201	UTR 11-11:50 am
7	UTR 1100-1150	24-125	Talal Al-Kharobi (talalkh@kfupm.edu.sa)	22-211	
8	UTR 1200-1250	24-125	Talal Al-Kharobi (talalkh@kfupm.edu.sa)	22-211	
9	UTR 1200-1250	59-1003	Kamal Chenaoua (cskamel@kfupm.edu.sa)	23-082	UT 11-11:50 am or by appointment
10	UTR 1300-1350	24-180	Gamil Ahmed (gamil.ahmed@kfupm.edu.sa)		
11	UTR 1200-1250	59-2009	Shujaat Khan (shujaat.khan@kfupm.edu.sa)	22-410-2	
12	MW 0830-0945	24-174	Muhammad Mahmoud (mimam@kfupm.edu.sa)	22-410-1	
13	MW 1030-1115	24-240-1	Muhammad Mahmoud (mimam@kfupm.edu.sa)	22-410-1	
14	MW 0830-0945	24-153	Abdulaziz Tabbakh (atabakh@kfupm.edu.sa)	22-213	MW 1130 am – 1230 pm or by appointment
15	MW 1030-1115	24-116	Akram Ahmad (akram@kfupm.edu.sa)	22-207	
16	MW 1100-1215	24-249	Hazim Selmi (hazem@kfupm.edu.sa)	23-057	U 11-12, 14-13 T 11-12 or by appointment