CMPE429- Deep Learning

Department:
Computer Engineering

Program Name: Computer Engineering	**Program Code:** 25	
Course Number: CMPE429	**Credits:** 4 Cr	**Year/Semester:** 2021-2022 FALL

☐ Required Course ☒ Elective Course

Prerequisite(s):
MATH241 – Linear Algebra and Ordinary Differential Equations

Catalogue Description:

A brief review of data pre-processing, linear algebra, automatic differentiation and essential packages from Python. Basic elements of linear regression, loss functions and their optimization. Softmax regression, vectorization for minibatch-based training based on cross-entropy loss function. Introduction to convolution layers, multi-channel inputs and cross-correlation operations in convolutional neural network architectures. Input padding, convolution window striding, maximum and average pooling. Implementation of convolutional neural networks and discussions on widely used architectures such as AlexNet, GoogLeNet and ResNet . Modelling sequential data using recurrent neural networks (RNN). Modern recurrent neural networks employing gated recurrent units and long short-term memory, and their applications. Unsupervised learning using autoencoder architectures. Discussions on various types such as simple and sparse autoencoders and their implementations.

Course Web Page: https://staff.emu.edu.tr/hakanaltincay/en/teaching/cmpe429

Textbook(s):
Dive into Deep Learning, A. Zhang, Z. Lipton, M. Li, A. Smola. (*https://d2l.ai*)

Topics Covered and Class Schedule: (4 hours of lectures per week)

Week 1   Introduction to deep learning.

Week 2   Essential concepts of linear and automatic differentiation

Week 3   Linear Neural Networks

Week 4   Nonlinear Neural Networks.

Week 5   Computations for deep learning

Week 6   Introduction to Convolutional Neural Networks.

Week 7   Modern Convolutional Neural Network structures

Week 8-9   Midterm Exam Period

Week 10-11   Recurrent Neural Networks.

Week 12   Modern RNN structures

Week 13-14   Case studies for deep learning

Week 15-16   Final Exam Period

Assignment Schedule:

The preliminary schedule is as follows:

#1– TBA
#2– TBA
#3– TBA
#4– TBA
#5– TBA

Course Learning Outcomes:

On successful completion of this course, all students are expected to be able to:

    (1) Learn basics of artificial intelligence
    (2) Understand model training and testing
    (3) Implement models for regression and classification
    (4) Train and test neural networks
    (5) Train and test convolutional neural networks
    (6) Train and test recurrent neural networks
    (7) Performance evaluation of models

	Method	No	Percentage
Assessment	Midterm Exam	1	20%
	Assignments	5	30%
	Term Project	1	30%
	Final Examination	1	20%

Contribution of Course to Criterion 5
Credit Hours for:
Mathematics & Basic Science : 0
Engineering Sciences and Design : 4
General Education : 0

Relationship of Course to Program Outcomes

The course has been designed to contribute to the following program outcomes:

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

Exams:

- You have re-sit exam chance at the end of semester if you fail. Note that; if your letter grade is "D" or above and you have no warning, you will not be able to enter re-sit exam. Yet, be aware that if you attend the re-sit exam, grade you get will be replace your final exam grade even if your grade is decreased.
- If you miss the midterm or the final midterm exam and submit a written report to your instructor stating your excuse within 3 days of that examination, you will be able to take a makeup of the missed exam.
- If you miss both midterm and final exams and do not submit any written report, you will get an "NG" grade. In the same case, if you submit report for both missed exams, you will be able to enter make-up for one of them only.

Plagiarism:

- Plagiarism (which also includes any kind of cheating in exams, assignments, and lab works) is a disciplinary offence and will be dealt with accordingly. Furthermore, the penalty of plagiarism is to get grade zero for the corresponding exam, assignment, or lab work.

Important Remarks:

- You should have regular attendance to the lectures for being successful in the course. Course related materials, exercises, laboratory experiments, old exam questions and announcements will be published on the course web site and you will be responsible from all. Note that the course web site can update during the semester. Therefore, please check it regularly.

| **Prepared by** Prof. Dr. Hakan Altınçay | 11/9/2021 |