KOÇ ÜNİVERSİTESİ

ENGR 421 (01) INTRODUCTION TO MACHINE LEARNING

Fall 2023

1. Course Information

Instructor:	Mehmet Gönen, mehmetgonen@ku.edu.tr
KU Credits:	3.00
ECTS Credits:	6.00
Prerequisite(s):	Prerequisite: MATH 107 and 203 and ENGR 200 AND COMP 110 or 125 or 131
Class Location & Meeting Times:	SNA A21 - Monday, Wednesday 08:30-09:40
PS (Yes/No):	No
DS (Yes/No):	No
Lab (Yes/No):	Yes
Language of Instruction:	English
Office Hours:	Monday 10:00-11:10 and Wednesday 11:30-12:40 (face-to-face at ENG 118)

2. Course Description

A broad introduction to machine learning covering regression, classification, clustering, and dimensionality reduction methods; supervised and unsupervised models; linear and nonlinear models; parametric and nonparametric models; combinations of multiple models; comparisons of multiple models and model selection.

3. Course Overview

Machine learning uses interdisciplinary techniques such as statistics, linear algebra, optimization, and computer science to create automated systems that can process large volumes of data to make predictions or decisions without explicit human intervention. This course (a) introduces students to a broad range of machine learning algorithms to prepare them for research/industry applications, (b) shows them how to combine multiple algorithms to obtain better results, and (c) shows them how to assess the performance of the algorithms.

4. Course Learning Outcomes (CLOs):

CLO #	Upon successful completion of this course, students will be able to…
1	Comprehend the core differences in analyses enabled by regression, classification, clustering, and dimensionality reduction algorithms
2	Select the appropriate machine learning algorithms for real-life applications
3	Assess the model quality in terms of relevant performance/error metrics for each application
4	Apply machine learning algorithms to real-life problems and optimize the models learned

5. Assessment Methods

Method	Description	Weight %
Homework	6 Homeworks (Lowest grade will be dropped)	20.00
Midterm Exam	2 Midterm Exams	40.00

Final Exam	Final Exam		40.00
		Total:	100.00

6. Instructional Material and Learning Resources

- Introduction to Machine Learning, Edition: 4th (ISBN: 978-0-262-358064)

Author:	Ethem Alpaydın
Publisher:	The MIT Press (Year: 2020)
Material Type:	Textbook
Material Status:	Required
Additional Notes:	https://mitpress.mit.edu/9780262358064/introduction-to-machine-learning/

- Active Use of Course Page on Blackboard: No Service Available

- KOLT Tutoring: No Service Available

7. Course Schedule

Meeting Times	Subject
OCT 02	Lecture 01 - Introduction (Chapter 1)
OCT 04	Lecture 02 - Supervised Learning (Chapter 2)
OCT 06	NO DISCUSSION SESSION
OCT 09	Lecture 03 - Parametric Methods (Chapter 4)
OCT 11	Lecture 04 - Parametric Methods (Chapter 4)
OCT 13	Discussion Session 01 - Lab 01
OCT 16	Lecture 05 - Multivariate Methods (Chapter 5)
OCT 18	Lecture 06 - Linear Discrimination (Chapter 10)
OCT 20	NO DISCUSSION SESSION
OCT 23	Lecture 07 - Linear Discrimination (Chapter 10)
OCT 25	Lecture 08 - Linear Discrimination (Chapter 10)
OCT 27	NO DISCUSSION SESSION
OCT 30	Lecture 09 - Multilayer Perceptrons (Chapter 11)
NOV 01	Lecture 10 - Multilayer Perceptrons (Chapter 11)
NOV 03	Discussion Session 02 - Lab 02, Lab 03, and Lab 04
NOV 06	Lecture 11 - Deep Learning (Chapter 12)
NOV 08	Lecture 12 - Nonparametric Methods (Chapter 8)
NOV 10	Discussion Session 03 - Lab 05
NOV 13	NO LECTURE
NOV 15	NO LECTURE
NOV 17	NO DISCUSSION SESSION
NOV 20	Lecture 13 - Nonparametric Methods (Chapter 8)
NOV 22	Lecture 14 - Decision Trees (Chapter 9)
NOV 24	NO DISCUSSION SESSION
NOV 27	Lecture 15 - Decision Trees (Chapter 9)
NOV 29	Lecture 16 - Kernel Machines (Chapter 14)
DEC 01	Discussion Session 04 - Lab 06 and Lab 07

DEC 04	Lecture 17 - Kernel Machines (Chapter 14)
DEC 06	Lecture 18 - Kernel Machines (Chapter 14)
DEC 08	NO DISCUSSION SESSION
DEC 11	Lecture 19 - Dimensionality Reduction (Chapter 6)
DEC 13	Lecture 20 - Dimensionality Reduction (Chapter 6)
DEC 15	Discussion Session 05 - Lab 08 and Lab 09
DEC 18	Lecture 21 - Dimensionality Reduction (Chapter 6)
DEC 20	Lecture 22 - Clustering (Chapter 7)
DEC 22	Discussion Session 06 - Lab 10
DEC 25	Lecture 23 - Clustering (Chapter 7)
DEC 27	Lecture 24 - Combining Multiple Learners (Chapter 18)
DEC 29	Discussion Session 07 - Lab 11
JAN 01	NO LECTURE
JAN 03	Lecture 25 - Combining Multiple Learners (Chapter 18)
JAN 05	Discussion Session 08 - Lab 12
JAN 08	Lecture 26 - Design and Analysis of Machine Learning Experiments (Chapter 20)
JAN 10	Lecture 27 - Design and Analysis of Machine Learning Experiments (Chapter 20)
JAN 12	Discussion Session 09 - Final Review

8. **Student Code of Conduct and Academic Grievance Procedure**

   Student Code of Conduct

   Statement on Academic Honesty with Emphasis on Plagiarism

   Academic Grievance Procedure

9. **Course Policies**

   (i) If you miss one of the midterm exams with a valid excuse, your final exam grade will be counted as your missing grade.

10. **Other**