

**ENGR 421 (01) INTRODUCTION TO MACHINE LEARNING**

Spring 2024

**1. Course Information**

<b>Instructor:</b>	Mehmet Gönen, mehmetgonen@ku.edu.tr
<b>KU Credits:</b>	3.00
<b>ECTS Credits:</b>	6.00
<b>Prerequisite(s):</b>	Prerequisite: MATH 107 and 203 and ENGR 200 AND COMP 110 or 125 or 131
<b>Class Location &amp; Meeting Times:</b>	
<b>PS (Yes/No):</b>	No
<b>DS (Yes/No):</b>	No
<b>Lab (Yes/No):</b>	Yes
<b>Language of Instruction:</b>	English
<b>Office Hours:</b>	TBA

**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):**

<b>CLO #</b>	<b>Upon successful completion of this course, students will be able to...</b>
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**

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

	<b>Total:</b>	100.00
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## 6. Instructional Material and Learning Resources

- Introduction to Machine Learning, Edition: 4th (ISBN: 978-0-262-358064)
  - Author:** Ethem Alpaydin
  - 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: <https://ku.blackboard.com/>
- KOLT Tutoring: No Service Available

## 7. Course Schedule

Meeting Times	Subject
FEB 12	Lecture 01 - Introduction (Chapter 1)
FEB 14	Lecture 02 - Supervised Learning (Chapter 2)
FEB 19	Lecture 03 - Parametric Methods (Chapter 4)
FEB 21	Lecture 04 - Parametric Methods (Chapter 4)
FEB 26	Lecture 05 - Multivariate Methods (Chapter 5)
FEB 28	Lecture 06 - Linear Discrimination (Chapter 10)
MAR 04	Lecture 07 - Linear Discrimination (Chapter 10)
MAR 06	Lecture 08 - Linear Discrimination (Chapter 10)
MAR 11	Lecture 09 - Multilayer Perceptrons (Chapter 11)
MAR 13	Lecture 10 - Multilayer Perceptrons (Chapter 11)
MAR 18	Lecture 11 - Deep Learning (Chapter 12)
MAR 20	Lecture 12 - Nonparametric Methods (Chapter 8)
MAR 25	Lecture 13 - Nonparametric Methods (Chapter 8)
MAR 27	Lecture 14 - Decision Trees (Chapter 9)
APR 01	Lecture 15 - Decision Trees (Chapter 9)
APR 03	Lecture 16 - Kernel Machines (Chapter 14)
APR 08	Lecture 17 - Kernel Machines (Chapter 14)
APR 10	NO LECTURE
APR 15	NO LECTURE
APR 17	NO LECTURE
APR 22	Lecture 18 - Kernel Machines (Chapter 14)
APR 24	Lecture 19 - Dimensionality Reduction (Chapter 6)
APR 29	Lecture 20 - Dimensionality Reduction (Chapter 6)
MAY 01	NO LECTURE
MAY 06	Lecture 21 - Clustering (Chapter 7)
MAY 08	Lecture 22 - Clustering (Chapter 7)
MAY 13	Lecture 23 - Combining Multiple Learners (Chapter 18)
MAY 15	Lecture 24 - Combining Multiple Learners (Chapter 18)

MAY 20	Lecture 25 - Design and Analysis of Machine Learning Experiments (Chapter 20)
MAY 22	Lecture 26 - Design and Analysis of Machine Learning Experiments (Chapter 20)

## **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**