Department of Industrial Engineering
Middle East Technical University

IE 460 Introduction to Data Mining *(Data Science)* – Fall 2024

Instructor: Cem IYIGUN (**iyigun@metu.edu.tr**)
Office 331

Office Hours: *TBA*

Lecture Hours : TBA

TA's : TBA

Textbook(s) and reference books:

> **I do provide lecture notes and reading material every week but the following list will be very helpful for following the lectures.**

(1) N. Ye, *Data Mining: Theories, Algorithms and Examples*, 1st edition, CRC Press, 2013 (Available as an E-book at METU LIB)
(2) M. Bramer, *Principles of Data Mining*, 2nd edition, Springer, 2013 (Available as an E-book at METU LIB)
(3) N. N Murty, V. S. Devi, *Pattern Recognition*, *An Algorithmic Approach,* 1st edition, Springer, 2012 (Available as an E-book at METU LIB)
(4) P.N. Tan, M. Steinbach and V. Kumar, *Introduction to Data Mining* , 3rd edition, Addison Wesley, 2010
(5) I.A. Witten and E. Frank, *Data Mining: Practical Machine Learning Tools and Techniques*, 2nd edition, Morgan Kaufmann, 2005.
(6) M.H. Durham, *Data Mining: Introductory and Advanced Topics*, 2nd edition, Prentice Hall, 2003.

Software: MATLAB and/or R-Studio

Overview/Objectives:

Data mining (DM) is a powerful tool for processing large volumes of data to discover hidden knowledge in databases. It can be generally viewed as a statistical analysis of data. Also use of mathematical programming enhances traditional methods and leads to new algorithms such as support vector machines. There have been many successful applications of data mining in industrial engineering. DM techniques can be used in supply chain management, quality and process control, manufacturing operations and customer relationship management.

Introduction to Data Mining course is a second level course in engineering data analysis and data mining. The emphasis is on understanding the application of a wide range of modern techniques to specific decision-making situations. Upon successful completion of the course, you should possess valuable practical analytical skills that will equip you with a competitive edge in almost any contemporary workplace. The course covers methods that are aimed at prediction, association, classification, and clustering. It also introduces optimization foundation of the data mining tehniques.

Course Topics (Weekly Schedule) :

- *Week-1 : Introduction to Data Mining; What is Big Data ? What is Business Analytics ?*

- *Week-2 : Data Types and Exploring Data Input and Output Representation*

- *Week-3 : Distance Measures*

- *Week-4 : Dimension Reduction, Principal Component Analysis (PCA)*

Cluster Analysis

- *Week-5 : K-Means Clustering and variants, Hierarchical Clustering*

- *Week-6 : Density-based Clustering, Fuzzy Clustering*

- *Week-7 : Cluster Evaluation and Validation*

Classification Algorithms

- *Week-8 : Basic Concepts, Naïve Rule, K-Nearest Neighbour Classifiers*

- *Week-9 : Bayesian Classifiers*

- *Week-10 : Decision Trees*

- *Week-11-12 : Perceptrons, Multilayer Artificial Neural Networks*

- *Week-13-14 : Support Vector Machines (SVM)*

Grading:
Your final letter grade for the semester will be determined by several components according to the following system of weights:

- Quizes or In-class Assignments (3-4)   10%
- Coding Assignments (6-7)   40%
- Midterm Exam   20%
- Final Project   30%

Course Website
The course website is hosted in the 'METU Online' course environment (https://odtuclass.metu.edu.tr/).

Course Pre-Requisites
IE 266 is pre-requisites for this course. It is expected that all students are familiar with elementary probability and statistics, up to and including the basics of linear regression.

Other Course Policies
- Academic Integrity: The University's Code of Academic Integrity is designed to ensure that the principles of academic honesty and integrity are upheld. All students are expected to adhere to this Code. METU does not tolerate academic dishonesty. All acts of academic dishonesty will be dealt with in accordance with the provisions of this code. For more information on the Code of Academic Integrity, please visit **http://www.oidb.metu.edu.tr/kilavuz/os09/onur.html**, you should neither give nor receive assistance from anyone in doing the individual assignments and quizzes.