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Sabancı University

Faculty of Engineering and Natural Sciences

EE 566 - Pattern Recognition

Fall 2022-2023

Course Information

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Lecturer	: Hüseyin Özkan, `huseyin.ozkan@sabanciuniv.edu`
	Room: FENS 1107, Phone: x9594.
Textbook	: K. P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
Lecture Hours	: Monday 08:40-09:30 (FENS L055), Tuesday 15:40-17:30 (FENS L035).
Office Hours	: By appointment (please drop me an email to arrange one).
Course Objectives	: To provide a probabilistic perspective on machine learning and a grasp of the most recent developments in research.
Prerequisite	: Probability, linear algebra, and programming. An introductory machine learning course is a plus, though not required.
Grading Policy	: Assignments, 50%; Project, 25%; Final, 25%.

Topics and Schedule (tentative):

- Chapter 1: Detection and estimation **(3 weeks)**

    Hypothesis testing, Neyman-Pearson Formulation, Minmax decision rule

    MMSE, MMAE, MAP and ML estimation

    Examples

  — Assignment 1 is out. **(Grading: 50/4 points)**

- Chapter 2: Observation modeling **(3 weeks)**

    Parametric models: Expectation-maximization, GMM and HMM

    Nonparametric density estimation approaches and RNNs (here, a review of neural networks)

  — Assignment 2 is out. **(Grading: 50/4 points)**

- Chapter 3: Dimensionality, and manifold learning **(3 weeks)**

    Principle component analysis

    Multidimensional scaling and Isomap

    Autoencoders and variational extensions

    Feature selection

  — Assignment 3 is out. **(Grading: 50/4 points)**

- Project proposal **(1 week)**. No lectures in this week 10; instead, you are scheduled to propose your class project. An in-class presentation and a brief (1-2 pages) report are required. That means, you present the problem description and the data you plan to work on, and explain why it is worth solving in comparison to the related work in the literature. Please also explain what the right evaluation strategy is, in other words, please explain how the performance is measured. You are also scheduled to present a paper from that related work (the one that

impresses/inspires you the most) you discuss in your presentation. Each presentation shall be limited to 15 minutes. You can form groups of two (perhaps three at most). And you are strongly encouraged to pick a project topic that is related to your own research. If you are unsure about what to pick, let me know. You should work on a supervised or unsupervised machine learning problem. The brief report shall summarize your presentation. **(Grading: 10 points)**

- Chapter 4: Supervised learning **(4 weeks)**

    Perceptron, SVM and AdaBoost

    Least-squares regression, RLS and LMS

    Various LMS update strategies

    Kernelization

    — Assignment 4 is out. **(Grading: 50/4 points)**

- Take-home final exam in week 15 **(Grading: 25 points)**

- Final project report and demo in week 15 **(Grading: 15 points)**

Important note: We use SUCourse+ as the communication medium throughout the course. Anything posted on SUCourse+ is assumed to be instantly known by everyone in the class!