

COURSE RECORD

Code	ECE 663
Name	Pattern Recognition
Hour per week	3+0 (Theory + Practice)
Credit	3
ECTS	10
Level/Year	Graduate
Semester	Fall, Spring
Type	Elective
Location	
Prerequisites	Art of Computing, Calculus, Probability and Statistics, Linear Algebra, Machine Learning
Special Conditions	
Coordinator(s)	Zafer Aydın
Webpage	
Content	This course provides an introduction to pattern recognition. It covers generative models, Bayesian learning methods, decision theory, Gaussian models, Bayesian statistics, frequentist statistics, regression models, generalized linear models and the exponential family, mixture models, expectation maximization, latent linear models, and sparse linear models. Mathematical principles will be explained to provide a solid foundation for pattern recognition. Methods will be implemented by a software and applied on various machine learning problems.
Objectives	01. Gain an understanding of pattern recognition methods 02. Learn the techniques used for developing pattern recognition models 03. Gain practice by completing programming assignments 04. Apply the concepts to a real problem by completing a course project
Learning Outcomes	L01. Explain the mathematical and algorithmic principles of pattern recognition methods L02. Solve a learning problem using pattern recognition methods L03. Implement a pattern recognition model using a software L04. Apply a pattern recognition method to a real problem
Requirements	A GPA higher than 3.0 or high letter grades from prerequisite courses.
Reading List	1. Machine Learning, a Probabilistic Perspective, K. P. Murphy, MIT Press, 2012. 2. Pattern Recognition and Machine Learning, C. Bishop, Springer, 2006. 3. Elements of Statistical Learning: Data Mining, Inference and Prediction, T. Hastive, R. Tibshirani, Springer, 2016.
Ethical Rules and Course Policy	Cheating in assignments and exams is strictly prohibited.

LEARNING ACTIVITIES

Activities	Number	Weight (%)
Lectures (on-site)	14	30%
Lectures (online videos)	5	20%
Problem solving and assignments	12	30%
Project and Presentations	1	20%
	Total	100

ASSESSMENT

Evaluation Criteria	Weight (%)
Quizzes	10%
Homework Assignments	30%
Project Assignment and Presentation	20%
Midterm Exam	20%
Final Exam/Submission	20%
Total	100%

For a detailed description of grading policy and scale, please refer to the website <https://goo.gl/HbPM2y> section 28.

COURSE LOAD

Activity	Duration (hour)	Quantity	Work Load (hour)
Lectures	3	14	42
Research (web, library)	5	1	5
Required Readings	1	14	14
Online course videos	1	7	7
Assignments	7	12	84
Project	40	1	40
Pre-work for Presentation	4	1	4
Pre-work for Quizzes	1	5	5
Pre-work for Midterm	20	1	20
Pre-work for Final	30	1	30
General Sum			251

ECTS: 10 (Work Load/25-30)

CONTRIBUTION TO PROGRAMME OUTCOMES*

	PO1	PO2	PO3	PO4	PO5	PO6
LO1	5	5	3	3	3	3
LO2	5	5	4	4	4	3
LO3	4	5	5	5	3	3
LO4	4	5	5	5	5	4

* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

WEEKLY SCHEDULE

W	Topic	Outcomes
1	Generative models for discrete data Activity: Online video lectures, readings	LO1, LO2
2	Gaussian models Activity: Online video lectures, readings, homework	LO1, LO2, LO3
3	Gaussian models Activity: Online video lectures, readings, quiz, homework	LO1, LO2, LO3
4	Bayesian statistics Activity: Online video lectures, readings, homework	LO1, LO2, LO3
5	Frequentist statistics Activity: Online video lectures, readings, homework	LO1, LO2, LO3, LO4
6	Bayesian linear and logistic regression Activity: Readings, quiz, homework	LO1, LO2, LO3, LO4
7	Midterm Exam	LO1, LO2
8	Semester break	
9	Generalized linear models and exponential family Activity: Readings, homework	LO1, LO2, LO3, LO4
10	Mixture models and EM algorithm Activity: Readings, quiz, homework	LO1, LO2, LO3, LO4

11	Latent linear models Activity: Readings, quiz, homework	L01, L02, L03
12	Sparse linear models Activity: Readings, homework	L01, L02, L03
13	Sparse linear models Activity: Readings, homework	L01, L02, L03
14	Kernel machines Activity: Readings, homework, quiz	L01, L02, L03, L04
15	Gaussian processes Activity: Readings, homework	L01, L02, L03, L04
13	Final exam Activity: Project presentations	L01, L02, L04

Prepared by
Dr. Zafer Aydın
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