SUBJECT TEACHING GUIDE

249 - AUTOMATIC LEARNING II

University Master's Degree in Data Science

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	University Master's Degree in Data Science			Type and Year	Optional. Year 1
Faculty	Faculty of Sciences				
Discipline	INTELLIGENCE IN DATA SCIENCE				
Course unit title and code	249 - AUTOMATIC LEARNING II				
Number of ECTS credits allocated	4	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA DE COMUNICACIONES
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Other lecturers	STEVEN JOHAN MARIA VAN VAERENBERGH SIXTO HERRERA GARCIA JAVIER DIEZ SIERRA MAIALEN ITURBIDE MARTINEZ DE ALBENIZ

3.1 LEARNING OUTCOMES
- To understand the fundamentals of statistical learning theory
- To understand kernel methods and their application to classification and regression problems.
- The understand the concept of latent variable and how to use it in Bayesian inference problems.
- To analyze discrete datasets using Probabilistic Networks.

4. OBJECTIVES

- To know the fundamentals of statistical learning theory.

- To know how to apply kernel methods in classification, regression, and data analysis problems.

-To know the use of latent variables in graphical and probabilistic models.

- To know how to apply probabilistic models and probabilistic networks in data analysis and machine learning problems.

6. SUBJECT PROGRAM

CONTENTS	
1	Statistical Learning. Kernel methods for classification (SVM). Kernel methods for regression (SVR). Kernel Ridge Regression. Gaussian Processes. Unsupervised kernel methods.Kernel PCA. Spectral Clustering. Kernel K-means. Kernel methods for time series analysis. Kernel adaptive filtering.
2	Bayesian classifiers. Naive Bayes anf Hidden Markov Models. Discrete Probabilistic Networks. Gaussina Probabilistic Networks. Inference with Probabilistic Networks. Learning Probabilistic Networks.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Evaluation of the reports of practices.	Activity evaluation with Virtual Media	Yes	Yes	60,00
Exam covering the concepts explained in the subject.	Activity evaluation with Virtual Media	Yes	Yes	40,00
TOTAL				100,00

Observations
To recover the course, each practice failed should be repeated.
Observations for part-time students
The criteria for the evaluation will be the same.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

S. Y. Kung, "Kernel Methods and Machine Learning", Cambridge University Press, 2014

B. Schölkopf, A. J. Smola, " Learning with Kernels", The MIT Press, 2002.

C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006

K. P. Murphy, "Machine Learning: A Probabilistic Perspective", The MIT Press 2012.

R. Nagarajan, M. Scutari, S. Lèbre, "Bayesian Networks in R with Applications in Systems Biology", Springer, 2013

M. Scutari, J.B. Denis, "Bayesian Networks with examples in R", CRC Press, 2014.

E. Castillo, J.M. Gutiérrez, A.S. Hadi, "Expert Systems and Probabilistic Network Models", Springer-Verlag, 1997.