FEDERICO SANTA MARÍA TECHNICAL UNIVERSITY
DEPARTMENT OF COMPUTING

SUBJECT: **MACHINE LEARNING**		ACRONYM: **INF-393**
PREREQUISITES: **ILI-280**	Credits: **4**	Exam: **Does not have**
Weekly Lecture Hours: **4**	Weekly Assistantship Hours: **0**	Weekly Laboratory Hours **2**

GOALS:

Upon passing the subject the student will be able to:
- Know the statistical and computational foundations of learning machines.
- Design and apply learning machines to shape recognition problems: classification, regression, association and forecasting.
- Know and apply the main machine learning algorithms.
- Apply the main algorithms to shape classification and recognition problems.

CONTENTS:

1. Statistical concepts in learning: problems of induction and statistical inference, parametric and non-parametric inference models, the generalization of the Glivenko – Cantelli – Kolmogorov theory.
2. Foundations of learning and generalization theory.
3. Probability density estimation and learning problem, convergence and convergence conditions for unknown probability measures.
4. Empirical risk and minimization principles: Key's theorem from learning theory, bounds and loss functions.
5. The perceptron and its generalizations, the Rosenblatt perceptron, the stochastic approximation method.
6. Elements of optimization theory Fermat's theorem, Lagrange's multiplier rule and Kühn-Tucker theory.
7. Artificial neural networks as generalized regression models.
8. The support vector machine (SVM), hyperplane approximation, statistical properties of optimal hyperplanes, generalization to high-dimensional spaces, SVM selection, SVM in shape recognition, SVM in multiple classification problems, applications.

BIBLIOGRAPHY:

- Vapnik, V.: ***"Statistical Learning Theory"*** **,** Wiley, New York, 1998.
- Mitchell, T.: ***"Machine Learning"*** **,** McGraw-Hill International, Singapore, 1997.
- Golden, R.: ***"Mathematical Methods for Neural Network Analysis and Design"*** , MA, 1966
- Duda, R., Hart, P., Stork, D.: ***"Pattern Classification"*** , Wiley, 2001

ELABORATED APPROVED DATE	H. Allende CC.DD. Agreement 07/08 05/27/2008	**OBSERVATIONS:**