Machine learning

Academic Year: (2018 / 2019) **Review date: 12-12-2018**

Department assigned to the subject: Department of Signal and Communications Theory

Coordinating teacher: MARTÍNEZ OLMOS, PABLO

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

STUDENTS ARE EXPECTED TO HAVE COMPLETED

None

COMPETENCES AND SKILLS THAT WILL BE ACQUIRED AND LEARNING RESULTS.

Basic Skills

- Acquisition of knowledge and skills that provide with a background of creativity in the development and application of ideas, often within a research context.
- Ability to apply acquired knowledge and to solve problems under novel or almost novel situations or within broader (multidisciplinary) contexts related with big data.
- Acquisition of skills for learning in an autonomous and continuous manner.

General Skills

- Ability to apply the theoretical foundation of collect, storage, processing and presentation of information, especially for big data volumes.
- Ability to identify the most suitable data analysis technique in each problem, and to apply it for obtaining the most appropriate solution to each one.
- Ability to obtain practical and efficient solution for processing of big data volumes.
- Skill to synthesize data analysis conclusions, and to communicate it clearly and convincingly in a bilingual environment.
- Ability to generate new ideas and to anticipate new situations, within the context of data analysis and decision making.
- Skill to working collaboratively and to collaborate with others autonomously.

Specific Skills

- Skill to design data processing systems, from the data gathering to statistical analysis and presentation of final results.
- Ability to apply the basic principles of machine learning to the design and improvement of data processing procedures.
- Ability to interpret the functional specifications of machine learning based software applications.
- Ability to identify the opportunity to apply machine learning techniques for solving real problems.

Learning outcomes

- Basic knowledge about machine learning techniques.
- Understanding of basic machine learning techniques.
- Making practical use of machine learning techniques in real problems
- Ability to analyse and select the most appropriate task in each technique
- Ability to determine when to apply machine learning techniques for solving real problems

DESCRIPTION OF CONTENTS: PROGRAMME

1. Kernels and Large Margin Classifiers
2. Gaussian Processes
3. Mixtures and Latent Variable Models
4. Markov and Hidden Markov Models
5. Deep Learning
6. Additional Topics

6.1. Randomness and Optimization: Random Projections, Sparsity, and Compressed Sensing

6.2. Text and Signal Processing Applications

LEARNING ACTIVITIES AND METHODOLOGY

The course is imparted in specific rooms and laboratories for the Master Program. It will include:

- Lectures for the presentation, development and analysis of the contents of the course.
- Practical sessions for the resolution of individual problems and practical projects in the laboratory
- Seminars for discussion with reduced groups of students

ASSESSMENT SYSTEM

The assessment of the students' performance will be done continuously over the semester. The assessment will be based on the individual problem and practical projects.

% end-of-term-examination:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

BASIC BIBLIOGRAPHY

- Murphy, K.P. Machine Learning. A Probabilistic Perspective, MIT Press, 2012

ADDITIONAL BIBLIOGRAPHY

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