Neural Networks

Academic Year: (2018 / 2019) **Review date: 05-05-2018**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: MARTÍNEZ OLMOS, PABLO

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

The students are expected to have basic knowledge of
- Calculus
- Programming skills
- Numerical optimization
- Statistical Learning
- Machine Learning

OBJECTIVES

CB1: Ability to understand knowledge in an area of ¿¿study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that they imply knowledge coming from the vanguard of their field of study.
CB2: Ability to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of ¿¿study
CB5: Ability to undertake further studies with a high degree of autonomy.
CE1: Ability to solve mathematical problems that may arise in engineering and data science. Ability to apply knowledge about: algebra; geometry; differential and integral calculation; numerical methods; numerical algorithm;

DESCRIPTION OF CONTENTS: PROGRAMME

This course introduces the student a set of basic tools to solve learning problems with neural networks. The course provides basic schemas for modeling
of problems of different nature, as well as tools for the numerical optimization of the model based on existing data.
PART I: GENERAL CONCEPTS
1. Introduction to neural networks. The multilayer perceptron.
2. Training of a neural network. Calculation of gradients using reverse propagation.
PART II: SUPERVISED LEARNING
3. Supervised learning with deep neural networks. An introductory example.
4. Sequential modeling: recursive neural networks. An introductory example.
PART II: LEARNING NOT SUPERVISED
5. Non-Supervised Learning with deep neural networks. An introductory example.
6. Generative models using deep neural networks.

LEARNING ACTIVITIES AND METHODOLOGY

AF1/MD1: LECTURES to introduce the main knowledge that students should acquire. They will receive the class notes and the basic texts of reference to facilitate the follow-up of the classes and the development of the subsequent work. Exercises were solved, practical problems on the part of the student and tests and evaluation test were carried out to acquire the necessary skills.

AF3/MD2: INDIVIDUAL OR GROUP WORK BY THE STUDENTS.

AF8/MD6: WORKSHOPS AND LABORATORIES.

AF9: FINAL EXAM. In which the knowledge, skills and abilities acquired throughout the course will be assessed globally.

ASSESSMENT SYSTEM

The realization and presentation of learning projects using neural networks on real data will account for 60% of the grade. A final exam will be 40%.

% end-of-term-examination:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

BASIC BIBLIOGRAPHY

- Cristopher Bishop Pattern Recognition and Machine Learning, Springer, 2006
- Ian Goodfellow and Yoshua Bengio and Aaron Courville Deep Learning, MIT Press, 2017
- Kevin Murphy Machine Learning A Probabilistic Perspective, MIT Press, 2012