Neural Networks

Academic Year: (2022 / 2023) **Review date: 19/05/2022 17:13:26**

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

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

% end-of-term-examination/test:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

The continuous evaluation (70%) will consist of partial exams, programming projects, and a competition based on real data.

The final exam will account for 30% of the evaluation. It will be a written exam that asks conceptual

% end-of-term-examination/test:	30
% of continuous assessment (assigments, laboratory, practicals…):	70

questions about the subject, but also questions about the programming projects carried out.

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