Applications of digital signal processing to transfer

Academic Year: (2023 / 2024) **Review date: 26/04/2023 12:32:48**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: MARTÍNEZ OLMOS, PABLO

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

The students are expected to have basic knowledge of
- principles of signal processing
- probability and statistics.

OBJECTIVES

Specific technical skills:

- Ability to design algorithms that address the classical problems of signal estimation and detection, and statistical model learning. Subject to complexity and performance constraints.

- Ability to analyze and assess the complexity and performance of signal processing methods.

- Ability to design, integrate and assess complex systems that involve various digital signal processing modules.

- Ability to use numerical analysis and data processing software.

General skills:
- Ability to analyze and summarize problems.
- Practical application of theoretical knowledge.
- Problem solving.
- Team work.

DESCRIPTION OF CONTENTS: PROGRAMME

The content of the course has been designed to first give a practical introduction to methods of artificial intelligence and , second , the application of the concepts learned in real problems oriented field of bioengineering and engineering data . This course seeks to strengthen the profile of the future telecommunications engineer with concepts and tools in high demand .

Unit 1. Supervised Learning:
- Unit 1.1. Regression
- Unit 1.2. Classification

Unit 2. Unsupervised Learning
- Unit 2.1. Clustering
- Unit 2.2. Dimensionality Reduction

Unit 3.Applications:
- Unit 3.1. Non-linear Dimensionality Reduction. Spectral Clustering.
- Unit 3.2. Text-mining and automatic document classification.
- Unit 3.3. Introduction to Deep Learning Using Tensor Flow

LEARNING ACTIVITIES AND METHODOLOGY

Lectures (3 ECTS):
Contents: basic theory and methods of signal processing in communications.
Methodology: classical lecture with use of slides, videos and white/blackboard.

Lab projects (3 ECTS):
Contents: implementation of algorithms in for the simulation and assessment of digital transmission systems.
Methodology: use of numerical software packages (matlab/octave) to study the performance of algorithms and systems.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	20
% of continuous assessment (assigments, laboratory, practicals…):	80

The final grade for the course will consist of the weighted sum of the grade of the practical projects (80%) and the final exam (20%).

BASIC BIBLIOGRAPHY

- Alan Oppenheim, Alan S. Willsky Signal and Systems, Pearson, Prentice Hall.

- Christopher M. Bishop Pattern Recognition and Machine Learning, Springer.

- David Barber Bayesian Reasoning and Machine Learning, Cambridge University Press, 2012

- S. Haykin Adaptive Filter Theory, Prentice Hall, 2001

- Steven Kay Fundamentals of Statistical Signal Processing, Prentice Hall.

- Steven Kay Fundamentals of Statistical Signal Processing, Prentice Hall.