Universidad Carlos III de Madrid

Music Technologies

Academic Year: (2019 / 2020)   Review date: 15-05-2020

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: PELAEZ MORENO, CARMEN

Type: Electives ECTS Credits : 3.0

Year :   Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear Systems

OBJECTIVES

To undestand the fundamentals of music digital processing and its relationship with human perception and cognition.
To understand the representations and description methods of the fundamental aspects or facets of music (pitch, temporal, harmonic, timbral, editorial, textual and bibliographic).
To understand basic music processing methods (audio effects, gender and instrumental classification, source separation, singing-voice processing, transcription, synthesis, composition, etc.)
To understand the basics of music search, retrieval and access to musical content.
To understand user profiling methods for personalized music recomendation.
To design and implement music retrieval and recommendation systems.

DESCRIPTION OF CONTENTS: PROGRAMME

Unit 0. Fundamentals of Digital Music Processing. Perception and Cognition.
Unit 1. Music description and interpretation.
Unit 2. Methods for music processing.
Unit 3. Music Information Retrieval.
Unit 4. User Profiling and music recommendation.

LEARNING ACTIVITIES AND METHODOLOGY

The following learning activities and methodologies are employed: Combined master and lab classes, flipped classes and final project.

Teachers are available during 2 hours per week for office hours.

Combined master and lab clases (2 ECTS):

Master classes provide an overview of the main theoretical & mathematical concepts of the representation and processing of music along with the analytic tools employed for indexing and accessing to music contents and for the profiling and automatic recommendation of music.
In these classes, lab examples will be introduced as part of the theoretical expositions: all the formative sessions (lab availability provided) will take place in the lab to imbricate practical examples within the explanations to add dynamism to the class. This is also beneficial to solve different background issues given the possibility to access this subject from all the degrees from the Telecommunications family.
Moreover, every unit will begin with a debate of its technological implications. For this purpose, flipped classroom methodologies will be employed. In particular, students will be provided with some selected videos in advance to motivate the debate together with a list of questions (sometimes controversial) that the instructor will not answer categorically to encourage discussions. In this way, we expect to awake the curiosity of the student on the materials that will be subsequently explained.

FINAL PROJECT (1 ECTS)
Students will work on a project in which they will program a complete modular system of one of the tools explained in class (sound effects, musical gender or instrument classification, sound separation, singing voice processing, transcription, synthesis, composition, music information retrieval and recommendation). The students will be provided with some guidelines and some preparatory sessions by using problema-based learning.

ASSESSMENT SYSTEM

Lab assignments and questionnaires (40%)
Final Project (60%)

% end-of-term-examination: 0

% of continuous assessment (assigments, laboratory, practicals…):   100

BASIC BIBLIOGRAPHY

- Meinard Müller Fundamentals of Music Processing: Audio, Analysis, Algorithms, Applications , Springer, 2015

- Tao Li (Editor), Mitsunori Ogihara (Editor), George Tzanetakis (Editor) Music Data Mining, CRC Press, 2011

ADDITIONAL BIBLIOGRAPHY

- A. S. Bregman Auditory Scene Analysis: The perceptual organization of Sound, MIT press, 1990

- Dan Ellis, Nelson Morgan, Ben Gold Speech and Audio Signal Processing: Processing and Perception of Speech and Music, Second Edition, Wiley-Interscience, 2011
- Klapuri, Anssi, Davy, Manuel (Eds.) Signal processing methods for music transcription, Springer-Verlag, 2006

BASIC ELECTRONIC RESOURCES

- Yang Li . SPM Special Issue on Recent Advances in Music Signal Processing:
https://signalprocessingsociety.org/newsletter/2019/01/spm-special-issue-recent-advances-music-signal-processing