Algorithms for multimedia information management

Academic Year: (2023 / 2024) **Review date: 28/04/2023 19:57:27**

Department assigned to the subject: Signal and Communications Theory Department

Coordinating teacher: PELAEZ MORENO, CARMEN

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear Systems

OBJECTIVES

The main goal of this course is to provide the students with the theoretical and methodological knowledge abouth algorithms and methods for multimedia information indexing and retrieval.

At the end of the course the students are expected to have acquired (or progress in the acquisition -for transversal competences-) the following competences:

1. TRANSVERSAL/GENERAL COMPETENCES:
1.1 Personal work abilities.
1.2 Analysis and Synthesis abilities.
1.3 Abilities for applying theoretical concepts to practical uses.
1.4 Abilities related to team work and collaboration.
1.5 Abilities related to oral and written presentations.

2. SPECIFIC COMPETENCES:
2.1 Theoretical and practical knowledge about technologies and methods for information indexing, retrieval and filtering.
2.2 Theoretical and practical knowledge about multimedia management systems: text, audio, image and video.
2.3 Abilities to design information retrieval, indexing and filtering systems

DESCRIPTION OF CONTENTS: PROGRAMME

The modern information overload problem caused by the availability of enormous amounts of information through internet makes it necessary to design systems that allow us to find the information we search and filter or personalize the information according to our needs. For that matter it is fundamental to be able to automatically index not only textual contents but also audio (music, speech, etc.) image or video, using methods based on the content or even collaborative tagging as the one taking place in social networks. Examples of these multimedia management systems are Google search (and all its variants as Google Image, Google Goggles, etc.), recommender systems and user profilers like those available in Amazon.

Lesson 0. Overview of Multimedia Information Management
Lesson 1. Multimedia descriptors
Lesson 2. Methods for multimedia Information management
Lesson 3. Information Retrieval and Filtering systems

LEARNING ACTIVITIES AND METHODOLOGY

Several types of learning activities are proposed: theoretical lessons, collaborative learning, lab assignments and final project.

Several methodologies will be adopted: theoretical lessons, collaborative learning, problem-based learning (with different levels of supervision and guidance).

THEORETICAL LESSONS (2.25 ECTS)
Theoretical lessons provide an overview of the main theoretical and mathematical concepts together with explanations about the analytical tools employed for multimedia information indexing, retrieval and filtering.

COLLABORATIVE LEARNING (0.5 ECTS)
We will build a practical example on the usage of the collaborative filtering methods explained in the class for content tagging, to produce a list of commercial information retrieval and filtering systems that the students will at the beginning assess at a user level and after technical knowledge acquisition, at a technical level.

GUIDED LAB ASSIGNMENTS (1.5 ECTS)
Three guided lab assignments have been designed with the purpose of allowing the students to put into practice the mathematical tools explained in the theoretical lessons. The students will learn to use different indexing and retrieval methods and to make sense of the results obtained. The three lab assignments will be: image clustering, face recognition and textual indexing.

FINAL PROJECT (1.75 ECTS)
The students will develop a simple retrieval or recommender system of their choice.

ASSESSMENT SYSTEM

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

The assessment will be composed of four parts:

30% Final Examination
30% Guided lab assignments: the students will fill in a questionnaire after each of the lab assignments.
30% Final Project: both the oral presentation and the materials provided will be assessed
10% + 5% (additional) Collaborative learning project: the contributions of each student will be evaluated.

BASIC BIBLIOGRAPHY

- C. D. Manning, P. Raghavan and H. Schultze Introduction to Information Retrieval, MIT press, 2008

- M. Lew Principles of Visual Information Retrieval, Springer, 2001

- Ricardo Baeza-Yates, Berthier Ribeiro-Neto Modern Information Retrieval: the concepts and technology behind search, 2nd Edition, Pearson, 2011

- S. Theodoridis and K. Koutroumbas Pattern Recognition, 4th ed., Academic Press, 2008

ADDITIONAL BIBLIOGRAPHY

- C. D. Manning and H. Schuetze Foundations of Statistical Natural Language Processing, MIT press, 1999

- H. M. Blanken, A. P. de Vries, H. E. Blok and L. Feng Multimedia Retrieval, Springer, 2007

- H. M. Blanken, A. P. de Vries, H. E. Blok and L. Feng Multimedia Retrieval (Data-Centric Systems and Applications), Springer, 2007

- A. Hanjalic Content-based Analysis of Digital Video, Kluwer Academic Publishers, 2004

- C. J. van Rijsbergen The Geometry of Information Retrieval, Cambridge University Press, 2004

- G. G. Chowdury Introduction to Modern Information Retrieval, 3nd ed., Neal-Schuman Publishers, 2010

- Mark T. Maybury Intelligent multimedia information retrieval, MIT press, 1997

- P. Perner Data Mining on Multimedia Data, Springer Verlag, 2002

- Pamela Forner, Henning Mu¿ller, Roberto Paredes Information Access Evaluation: multilinguality, multimodality and visualization, Springer, 2013