UNIVERSITÀ DI PAVIA

Anno Accademico 2018/2019

DIGITAL CONTENT RETRIEVAL

Enrollment year	2018/2019
Academic year	2018/2019
Regulations	DM270
Academic discipline	ING-INF/05 (DATA PROCESSING SYSTEMS)
Department	DEPARTMENT OF ELECTRICAL,COMPUTER AND BIOMEDICAL ENGINEERING
Course	COMPUTER ENGINEERING
Curriculum	Computer Science and Multimedia
Year of study	1°
Period	Annual (01/10/2018 - 14/06/2019)
ECTS	12
Lesson hours	90 lesson hours
Language	English
Activity type	WRITTEN AND ORAL TEST
Teacher	ALBANESI MARIA GRAZIA (titolare) - 12 ECTS
Prerequisites	The course assumes the knowledge of the basic concepts of textual retrieval, i.e., the relational database (DBMS, definitions and usage) and SQL languages.
Learning outcomes	The purpose of the course is to provide the advanced concepts about the creation, storage and retrieval of digital multimedia data, by accessing to collections of structured, semi-structured and unstructured data, containing, in addition to text, still images , video and audio. It is fundamental to understand the differences between the management of textual data and multimedia data, by considering which are the solved problems and which are still open, with the analysis of algorithmic solutions available today.
Course contents	Introduction to multimedia data: what does it mean in the modern media and its difference with the digital textual data. Collections of structured,

	semi-structured and unstructured data. Relationship between data, information and knowledge. An outstanding class of digital data : the images. Taxonomy of digital images for the purpose of storage and retrieval. Image quality: subjective and objective metrics and computational algorithms. The compression of digital data: techniques for compressing images. Wavelet Transform. Compression standards: JPEG and JPEG2000 The research data in digital media. Types of search. The search by metadata. The indexing. The search for content in digital images: for shape, for color and texture. The search for similarities: the approach of metric space. Distance measurements. Centralized indexes. Parallel Index (hints). Convergence between search engines and databases: the Search Based Applications (SBA). Collection of video data: examples of compressed video. Search in video. Sentiment and affective analysis. Collections of audio data: the semantic meaning of the audio data. Search by audio fingerprinting techniques. Case studies: the digital data behind social media. Examples of search by shape and colour. Search and retrieval in biometrics (collections of fingerprints, irises, faces). Case studies on visual digital data processing for information retrieval and knowledge definition.
Teaching methods	Concepts are explained during the lessons by means of Powerpoint slide and also also with the aid of code developed in Matlab; in this way, the student can easily connet the theory to results in several applicative fields, such as image and audio processing.
Reccomended or required readings	Gonzalez R., Woods R.. Digital Image processing, Pearson ed. V. Castelli, L. D. Bergman. Image Databases - Search and retrieval of digital imagery. Wiley, 2002. H. R. Wu, K. R. Rao. Digital Video Image Quality and Perceptual Coding. Taylor and Francis, 2006. P. Zezula, G. Amato, V. Dohnal, M. Batko. Similarity Search - The metric space approach. Springer, 2006.
Assessment methods	Written exam with open and closed questions. In the closed questions there is a penalty (of a thirtieth) for the wrong answers. The number of

	questions is related to their difficulties and evaluation for each of them is clearly explained in the text, for a maximum mark of 30/30. The last question is usually an open question and an excellet evaluation, in the case of 100% correct answers, gives the mark of 30/30 cum laude. No additional oral examination is scheduled.
Further information	URL: http://dcalab.unipv.it/didattica to search and retrieve information, downloadable slides, communication of the teacher and the possibility to request further explanation by e-mail or agree for an appointment in office hours.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile