



### DIGITAL CONTENT RETRIEVAL

<b>Anno immatricolazione</b>	2021/2022
<b>Anno offerta</b>	2021/2022
<b>Normativa</b>	DM270
<b>SSD</b>	ING-INF/05 (SISTEMI DI ELABORAZIONE DELLE INFORMAZIONI)
<b>Dipartimento</b>	DIPARTIMENTO DI INGEGNERIA INDUSTRIALE E DELL'INFORMAZIONE
<b>Corso di studio</b>	COMPUTER ENGINEERING
<b>Curriculum</b>	Computer Science and Multimedia
<b>Anno di corso</b>	1°
<b>Periodo didattico</b>	Annualità Singola (27/09/2021 - 17/06/2022)
<b>Crediti</b>	12
<b>Ore</b>	90 ore di attività frontale
<b>Lingua insegnamento</b>	English
<b>Tipo esame</b>	SCRITTO
<b>Docente</b>	ALBANESI MARIA GRAZIA (titolare) - 12 CFU
<b>Prerequisiti</b>	The course assumes the knowledge of the basic concepts of textual retrieval, i.e., the relational database (DBMS, definitions and usage) and SQL languages.
<b>Obiettivi formativi</b>	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.
<b>Programma e contenuti</b>	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).

Problems in searching on Web (social media, SEO, project of Web Site for an efficient ranking in Google)

Video processing for efficient Web searching (case study: a video curriculum)

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.

Basics of Project Management (SWOT and RISK analysis, GANTT chart) and their application to the case of a Personal Web Site.

#### Metodi didattici

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 connect the theory to results in several applicative fields, such as image and audio processing.

#### Testi di riferimento

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.

#### Modalità verifica

Verification of learning is done in two ways:

**apprendimento**

1) For working students or for those who do not choose to attend in presence, the preparation of an individual project where the student will be able to put into practice the notions acquired in the field of project management on an application case assigned during the course and agreed with the teacher. The project development and delivery methods will be explained on the teaching reference site (<http://csu.unipv.it/didattica/>) and made available with videotaped explanations or agreed upon during the student reception. If the grade of the project is not sufficient or is not accepted, an oral exam must be taken on the entire program.

2) for students who choose to attend in presence, a series of mini-projects or assignments carried out and delivered during the year: each assignment will contribute cumulatively to the final grade. In the event of failure to deliver an assignment or if the overall grade is not sufficient or is not accepted, an oral exam must be taken on the entire program.

**Altre informazioni**

URL: <http://csu.unipv.it/didattica/> to search and retrieve information, download slides, communication of the teacher and the possibility to request further explanations by e-mail or agree for an appointment in office hours.

**Obiettivi Agenda 2030 per lo sviluppo sostenibile**

[Gli obiettivi](#)