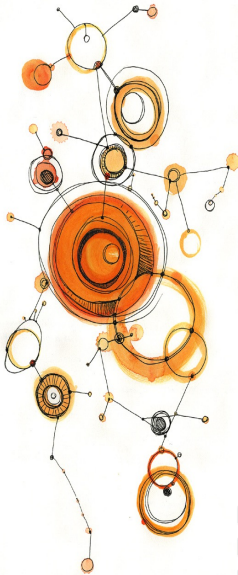




ALMA MATER STUDIORUM - UNIVERSITÀ DI BOLOGNA



# Modeling and Processing of Multimedia Data

International Second cycle degree programme (LM) in  
Digital Humanities and Digital Knowledge (DHDK)  
University of Bologna

**Course presentation**  
Academic Year 2024/2025

Home page: <http://www-db.disi.unibo.it/courses/DMMMDB/>  
Electronic version: 0.01.Presentation.pdf  
Electronic version: 0.01.Presentation-2p.pdf

Bologna, February 10<sup>th</sup>, 2025

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## Teacher

- **Prof.ssa Ilaria Bartolini**  
Coordinator of Ph.D. Program in Computer Science and Engineering

Department of Computer Science and Engineering (DISI)  
University of Bologna  
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### Multimedia Database Group

<http://www-db.disi.unibo.it/MMDBGroup/>

### Datalab

<http://www-db.disi.unibo.it/research/datalab/>



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## Contacts

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## General information and course calendar

- **Name:** “**Modeling and Processing of Multimedia Data**”
- **Credits:** 6
- **Teaching hours:** 30 hours
- **Period:** III
  - February 10<sup>th</sup>, 2025 – March 21<sup>st</sup>, 2025
- **Teaching hours:**
  - **Monday** – 9:00-12:00 (class start time 9:15)
  - **Friday** – 14:00-17:00 (class start time 14:15)
  - **Room:** AULA AFFRESCHI, - Via Zamboni, 34, 36 - Bologna

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## Course contents

### ▪ Learning outcomes

The course aims to **initiate the students to data modeling**, firstly **by reflecting on content type**: starting from traditional **metadata**, continuing with regular **(textual) documents**, and concluding with most complex **multimedia documents**.

At the end of the course the students will be able to:

- master the principles and fundamentals of documents' database management;
- master the most suitable methods of documents' content description, together with their indexing techniques and query paradigms;
- evaluate the quality of provided results through quantitative metrics;
- be familiar with the state-of-the-art of multimedia database management;
- analyze the requirements of specific contexts in the cultural heritage domain in order to identify the most appropriate solutions for modeling and managing the underlying data.

### ▪ Topics at a glance

- Basics on structured, semi-structured, and unstructured data models
- Textual Information Retrieval
- Multimedia Information Retrieval

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## Main goal

- *Facilitate and improve* the “**access**” to **documentary data repositories** for **general users**, conjunctively exploiting:

- dedicated users manually provided *metadata*
- *low level features* (e.g., document keywords, color of an image)
- semi-automatically provided **annotations**

➔ **Models,  
Algorithms,  
Interfaces**

### Archivio Storico Fiat



- **Trimotore Fiat G212**
- Data: **1947**
- Collezione: **Tema di cultura industriale**
- Tipologia: **Immagine**
- **Aereo, Motore, Ali**

### Cineteca



- **Das Cabinet des Dr. Caligari**
- Data: **1920**
- Nazione: **Germania**
- Regista: **Robert Wiene**
- Genere: **Horror**
- **Espressionismo, Ipnosi, Sonnambulismo**

### Archivio Artistico



- **La Gioconda**
- Sito: **Museo Louvre, Parigi**
- Secolo: **XVI**
- Autore: **Leonardo da Vinci**
- Periodo: **Rinascimento**
- Data: **1503**
- **Dipinto, Ritratto, Sorriso**

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## Detailed program

- **Data types classification**
  - Basics on structured, semi-structured, and unstructured data
  - Concepts of data modelling
- **Textual Information Retrieval (IR) systems: general principles**
  - Documents representation in IR systems
  - Automatic indexing techniques, stemming, stoplist
  - Searches of Boolean type
  - Searches of phrases and for proximity
  - The Vector Space model: weighing techniques and ranking of the results
  - Evaluation of IR systems: Precision and Recall metrics
- **Multimedia Information Retrieval (MM-IR)**
  - General concepts of MM-IR systems: feature extraction and similarity criteria
  - Examples for different types of multimedia data
  - Query paradigms and presentation of the results
  - Interactive searches

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## Course home page

<http://www-db.disi.unibo.it/courses/DMMDB/>

### Contents:

- News
- Copy of teaching materials and slides in PDF format
- Bibliography
- Useful links
- Assessment methods
- Exam sessions

The screenshot shows the course home page for 'Modeling and Processing of Multimedia Data M' (valido anche per Data Modelling and Multimedia Databases M). The page is from the University of Bologna, School of Engineering and Architecture. It includes sections for 'The course', 'Learning outcomes', 'Teacher' (Izara Bartolini), and 'News'. The 'News' section contains several updates regarding exam sessions and registration forms for the Academic Year 2023/2024.

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## Readings/Bibliography

- Education material **provided by the teacher**
  - copies of the **slides** used in the classroom
  - **relevant scientific literature** and **useful readings**
  - **links to real multimedia documents collections**

## Teaching methods

- Course lectures are in **“traditional” classrooms** and exploit the **slides**
- Several **real use cases** will be presented in order to show how such information technologies can be profitably applied in a number of real applications in the cultural heritage domain
- **Practical exercises**, based on the multi-medial interactive blackboard (or LIM), will be **carried out collegially**
- **A free exercise**, to be tackled by the students step-by-step, and after each single lecture (exploiting the dedicated “free exercises hours”), by applying theoretical concepts to the selected multimedia application.  
As detailed and explained in the slides **“0.04.FreeExercise-MMDBs.pdf”**, students can work alone or in team (max. 4 students).

## Assessment methods

- The exam evaluation consists of an **oral examination**
- The **admission of a student to the final examination is constrained to the upload of the complete solution of the free exercise into the dedicated OneDrive folder “DMMMDBs”**
- To participate to the exam, interested students must register themselves by exploiting the usual UniBO Web application, called AlmaEsami

## Examination sessions

- Six examination sessions per year divided as follows:
  - Two sessions before the summer
  - Starting from September, at the request of the students