

Structure of the class

Foundation	1 Introduction	We cover motivation, a summary of history, the generic retrieval process and its variations, a quick overview of metadata, and view demos to get us started
	2 Evaluation	We focus on evaluating and comparing retrieval systems and machine learning approaches. This serves as the basis for assessing the effectiveness of the methods covered in most of the chapters
	11 ML Methods*	We cover essential machine learning methods as needed for content analysis and the extraction of metadata items. As we progress through the course, we will visit individual chapters as need
Text & Web Retrieval	3 Classic	We explore classical text retrieval models, with a particular emphasis on vector space retrieval. We also delve into Lucene, OpenSearch and Elasticsearch which showcase the capabilities of these models
	4 Advanced	We examine natural language processing using NLTK as an example. Additionally, we explore contemporary methods for creating embeddings and leveraging generative AI to improve results
	5 Web & Social	We focus on web and social media retrieval, particularly examining methods to influence rankings based on the relationships between documents
	6 Vector Search	We explore the challenge of searching through embeddings and feature vectors. We discuss the “curse of dimensionality” and study contemporary techniques used by products like Lucene, OpenSearch, and Elasticsearch
Image Retrieval	7 Basic	We cover the human perception of visual signal information and examine several algorithms for extracting features that describe color, texture, and shape aspects found in the images
	8 Advanced	We delve into neural networks and explore the concept of deep learning. We apply these techniques to extract higher-level features, including classifications, facial recognition, and object bounding boxes
Audio Retrieval	9 Basic	We cover the human perception of audio signals and study various algorithms for extracting features in both the time and frequency domains. Additionally, we delve into the unique case of extracting musical features
Video Retrieval	10 Basic	We discuss fundamental elements of motion detection and video segmentation. Specifically, we focus on identifying shot and scene boundaries in videos

For exams, Chapter 11 requires the understanding of high-level concepts, basic formulas, and algorithms for each method. It's important that you can explain their applications for retrieval and discuss their strengths and weaknesses. You don't need to memorize formulas and algorithms beyond the basics concepts.

Timeline and Organization of the course

Date	Theory: 15:15 / 16:15	Practice: 17:05	Where*
Sep 22	1 Introduction	Python, Jupyter Notebook	University*
Sep 29	2 Evaluation	Ex 1, deep dive topics	University*
Oct 6	3 Classical Text Retrieval	Q&A, deep dive topics	tbd
Oct 13	3 Classical Text Retrieval	Ex 2, Q&A, deep dive topics	tbd
Oct 20	4 Advanced Text Retrieval	Q&A, ML process, neural networks	tbd
Oct 27	4 Advanced Text Retrieval	Ex 3, Q&A, transformers	tbd
Nov 3	5 Web and Social Retrieval	Prep Exam	University*
Nov 10	6 Vector Search	Ex 4, Q&A, deep dive topics	University*
Nov 17	7 Basic Image Retrieval	Ex 4, Q&A, convolutional networks	University*
Nov 24	<i>No Lessons (Dies Academicus, last Friday in November)</i>		
Dec 1	8 Advanced Image Retrieval	Ex 5, Q&A, deep learning	University*
Dec 8	9 Basic Audio Retrieval	Ex 5, Q&A, deep dive topics	University*
Dec 15	10 Basic Video Retrieval	Q&A, deep dive topics	University*
Dec 22	(11 ML Methods) – covered in the chapters we need them	Eval & Prep Exam	University*

- **Theory:** please study the material in advance. During the lessons, we will cover the essentials with demos and discussions, but some details will be omitted for self-study and to maintain a good pace. Refer to the schedule and announcements in ADAM. As a general rule, aim to read about 30-40 pages ahead
- **Practice:** during the 3rd hour, we engage in both theoretical and practical exercises. We explore Python and software packages relevant to the retrieval topics we cover. This part is optional, but active participation can benefit you in the exams (more details on the next page). No special materials are provided, and whenever possible, public tutorials will be used to introduce software packages. Feel free to join with a curious mindset and ask questions.

* University: Spiegelgasse 1, Seminarraum 00.003, **no zoom available, no video uploads** after lecture

* Zoom: see meeting link on Web / in ADAM, video uploads after lecture