
Syllabus

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Catalog description:
3 Credits
Study of the interdisciplinary research area of visual information retrieval. Research paper and project topics will be chosen from a list of latest developments and open challenges and opportunities in the field.

Prerequisites: Graduate-level status or permission from instructor. Background in multimedia, image and video processing, and human and/or computer vision a plus (but not required).

Course goals: To provide a deep and solid conceptual understanding of the fundamentals of visual information retrieval systems and their visual, textual, and computational aspects. To understand and appreciate the challenge involved in designing visual information retrieval systems. To enable students to carry out research on selected topics of interest in this field.

Textbook: None.

References: Several books, book chapters, journal and conference papers whose details will be provided during the semester.

Course outline:

1. Motivation
   “What is it that we’re trying to do and why is it so difficult?”

2. Principles of Visual Information Retrieval (VIR)
   a. Study of survey papers in the field
   b. The interdisciplinary nature of the field (and the contributions / biases of each discipline)
   c. Open problems, challenges and opportunities
   d. Sensory gap and semantic gap
   e. Emerging technologies and how they may help

3. Examples of contemporary VIR systems
   a. Research prototypes
   b. Commercial solutions

4. Visual features
   a. Shape
   b. Color
   c. Texture
   d. Motion
   e. The role of MPEG-7
   f. Features inspired by recent research in human vision

5. Selected concepts and principles from Information Retrieval (IR)
   a. IR models
   b. Retrieval performance evaluation
   c. Similarity models
   d. Indexing methods
   e. Query expression and relevance feedback (RF)

6. Semantic properties of visual data
   a. The need for (and the cost of) metadata
   b. Keywords
   c. Taxonomies, ontologies, folksonomies
   d. XML, RDF, and the Semantic Web

7. Designing a VIR system
   a. Defining scope and boundaries
   b. Choosing / creating / organizing the dataset
   c. Feature extraction and selection
   d. Similarity measures
   e. Query options
   f. User interface aspects
   g. Web-specific challenges and opportunities
   h. Other challenges

8. Case studies, success stories and additional emerging topics
Grading Policy (tentative): Grades will be determined primarily from the following:

- Research paper and presentation: 25%
- Mini-project: 15%
- Midterm exam: 25%
- Final project: 35%

Grading Scale:

- 92-100 = A
- 88-91 = A–
- 84-87 = B+
- 80-83 = B
- 77-79 = B–
- 73-76 = C+
- 70-72 = C
- 66-69 = C–
- 61-65 = D+
- 56-60 = D
- 50-55 = D–
- 0-49 = F

Important notes:

- The research paper will be assigned shortly after finishing Topic 2 in the syllabus. It will consist of a narrowly focused study on a particular aspect of VIR. It will be based on (typically 3-5) recent (2005 or newer) research papers in the field. I will provide a list of candidate topics and a list of relevant journals and conference proceedings to search for papers. Research papers will be presented to the rest of the class in a seminar format.

- The mini-project will be assigned at the end of Topic 4 and will be implementation-oriented. Students will use, extend and/or develop (MATLAB, Java, or C++) code for extracting visual features and comparing / classifying images based on the extracted features, in a pure content-based image retrieval (CBIR) fashion.

- The midterm exam will cover Topics 1-6 in the syllabus.

- The final project will also be implementation-oriented and will consist of building a complete, functional, VIR solution. Topic 7 in the syllabus will help students specify, design, build, and test their systems. Students will compete for the best project in the class in a format inspired by (but not as challenging as) the PASCAL Visual Object Classes (http://www.pascal-network.org/challenges/VOC/)

- This is a graduate-level course and will be taught as such. Students are expected to be familiar with the basics of literature search (e.g., using IEEEExplore, Google Scholar, Citeseer, etc.), the process of reading and summarizing scholarly articles (journal and conference papers). Students should also possess the ability to document their findings (in a scientific paper format) and present them to others.

- Reading assignments will be posted on the Web on a regular basis. Students are expected to read the material to be covered in the lectures ahead of time.

- Submission of papers and projects will be done electronically via Blackboard. No late submission will be accepted.

- Students are expected to attend all classes. As you expect the professors to attend on time, we also expect you to attend on time.

- Changes in class policies and/or office hours may be necessary during the semester and if so the changes will be announced in class and/or in the course home page. It is the student's responsibility to be aware of any such changes.

Course Home Page: A home page containing relevant information and useful links for the course is available at: http://blackboard.fau.edu/