CS 791Y Topics in Computer Vision
Spring 1998

Prerequisites: The pre-requisite for this course is CS 474 (Image Processing and Interpretation) but I will waive this requirement depending on the background of the interested student. Students who have taken any course related to Neural Networks and/or Genetic Algorithms are strongly encouraged to register for this course. Good programming skills and mathematical background will be essential.

Credit hours: 3.0

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Office Hours: MWF: 11:00 - 12:00 or by appointment.

Required Text:

Machine Vision by Jain, Kasturi, and Schunck, McGraw Hill, 1995.

Optional Texts:

A Guided Tour of Computer Vision by Nawla, Addison-Wesley.
Machine Vision by Davies, Academic Press, 1997.
Computer Vision and Image Processing: A Practical Approach Using CVIPtools by S. Umbaugh, Prentice Hall, 1998.

Objectives

This is an advanced level course suited for graduate students in Computer Science and Engineering. It is primarily intended for students who are interested in research in the area of Image Analysis/Image Understanding. There are many open problems in this area suitable for investigation by Master's students.

The following are some of the problems that will be emphasized in this course:

- Object Recognition
- Face Recognition
- Gesture recognition
- Character Recognition
- Texture Classification
- Medical Applications
- Applications using Neural Networks
- Applications using Genetic Algorithm

Course Policies

During the first 3-4 weeks of the semester, I will cover/review a number of important topics including Image Formation, Projection Geometry, Low Level Vision (smoothing, edge detection etc.) Shape Extraction, and Shape Representation. After that, I will discuss a number of important problems in Computer Vision and I will hand out a list of papers related to these problems. Each student is expected to choose a problem of his/her interest and 2-3 papers from the list of papers which he/she must study and present to the rest of the class. The presentation of the material should be professional as if it was presented in a formal conference. The student who is responsible for presenting a paper is expected to have a thorough understanding of the ideas discussed in the paper while the rest of the students are expected to study the paper and write a short summary including the main ideas discussed in the paper and *comments regarding to the strengths and weaknesses* of the approach discussed in the paper. The summaries should be typed.

Grading

Each student is expected to complete a research project. Ideally, this project will target a specific problem relevant to the graduate student's own research interests. Project reports are due at the last day of classes, and will be evaluated based upon both an oral presentation (or demo) and a written report. There are two targeted goals behind the implementation of a particular approach. The first goal is to verify that the approach works. Towards this goal, each student is expected to test his/her implementation using various data. The second and most important goal is to identify weak points of the approach, that is, to identify under what circumstances the approach will fail to produce good results and demonstrate this using data that actually make the approach fail or perform very poor. Identifying cases which cause problems to an approach is very important since somebody can develop superior approaches (e.g, by improving an existing approach or by proposing a new approach) to handle these cases successfully. The report should include:

1. Introduction and motivation

2. Analysis of relevant literature and previous research, and how it relates to the project

3. Problem definition, including project goals, assumptions, constraints, and evaluation criteria

4. Details of proposed approach, with sufficient mathematical and algorithmic detail to allow someone else to duplicate your results

5. Objective experimental evaluation and/or sound theoretical proof of proposed approach's performance

6. Implementation details

7. Results

8. Discussion and conclusion

The grade for this course will depend on the reading assignments, paper presentations, participation in class discussion, programming project, and a final paper based on the project. Note that good programming skills are essential in order for someone to complete the project successfully. Programming can be done using either C or C++. A number of image processing software packages will be available to assist you in the implementation phase of your project (please, visit the course's homepage at **http://www.cs.unr.edu/~bebis/CS791Y/index.html** for more information).

Grading Scheme

Project: 50%
Final Report: 20%
Weekly Reports: 10%
Presentations: 20%

Important dates

2/16/98 - no classes (holiday)
3/13/98 - last day for dropping classes
3/14/98 - 3/22/98 - no classes (Spring Break)
5/6/98 - no classes (preparation for final exam)