Computer Vision  
CS365, Spring 2012

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| Lectures        | Tuesday, Thursday  
|                 | 11:00 am – 12:15 pm, Roberts 221  
| Web site        | http://cs.colby.edu/courses/F12/cs365/  
| Text            | Richard Szeliski,  
|                 | Computer Vision  

**Description**

Investigates designing computer programs that extract information from digital images. Major topics include image formation and acquisition, grayscale and color image processing, image filters, feature detection, texture, object segmentation, classification, recognition, and motion estimation. Students are introduced to classic and contemporary vision techniques with examples for homework and programming assignments drawn from biological and medical imaging, robotics, augmented reality, and digital photography. They will develop a medium-scale vision system using data from active research projects at Colby.

**Prerequisites:** CS251, Data Analysis and Visualization, is a prerequisite for Computer Vision because it provides students with experience working with and analyzing data of many dimensions. These skills are valuable for working with imaging data and the output from image processing routines. CS251 and CS365 may be taken concurrently.

**Objectives**

1. Students understand the fundamentals of image formation and image acquisition.
2. Students understand and can implement image processing routines used in computer vision algorithms.
3. Students can discuss and implement computer vision algorithms for segmentation, classification, tracking, and shape estimation.
4. Students work in a group to design and develop a medium-sized image analysis and computer vision application.
5. Students present algorithms and results in an organized and competent manner, both written and orally.
Grading

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**Homework & Participation.** Approximately weekly homework assignments will consist of problem sets, writing, and short programming exercises. Homework is due by class time on the given due date. Because these assignments will typically be discussed in class, late homework is not accepted. You are encouraged to discuss the homework concepts with your classmates, but the work you submit must be your own. Homework is graded on a done/not done basis; remember to turn your homework in at the beginning of class the day it is due.

Active participation in the classroom is a critical component of education, and this depends on each student arriving at class prepared and on time. You are expected to attend all classes, and class participation forms a component of your grade. Extreme cases of absenteeism may result in failure of the course. You are expected to have completed any reading that will be discussed in the upcoming class and you are responsible for all information covered in class, whether or not you are there.

**Projects.** Several substantial programming projects will involve creating computer vision implementations and writing a description of the work. The grading policy on assignments is that the tasks specified explicitly in the project description will constitute about 85% of the assignment. If you complete the specified parts of the project properly, and produce a high quality write up, it's worth up to a B grade. In addition, the project description will include a variety of extensions, or you can come up with your own. The complexity and quality of the extensions will be incorporated into the final grade for the project.

Each assignment has a written component in which you will reflect on the problem you are solving and the effectiveness of your solution. This should be completed on your personal wiki page or a personal web site (you are free to choose), and a link to this page should be sent to the instructor. Do not post code on your website. The code for assignments should be submitted to the instructor via email (use a single zip file). The write up should include a description of the problem, a discussion of any required theory, a presentation of the results, and a discussion including possible enhancements.

For full credit, assignments should be submitted by 11:59:59 pm on the due date. You will typically have twice as much time as you need to complete each project; it is your responsibility to budget your time appropriately. Late assignments will incur a 10% penalty per day.

**Final Project:** The final project is a complete computer vision system that addresses a particular problem from a current research project at Colby. Final projects will be completed in teams; throughout the semester your team will create a project proposal that formalizes goals, implement and test the vision system, describe your project and results with a written document, and create a short presentation for a general audience or a poster for a research colloquium.
Exams. There will be one in-class midterm exam and a cumulative final exam. The midterm exams is tentatively scheduled for Thursday 15 March. The final exam period for this class is Wednesday 9 May 2012 at 9:00 am.

Collaboration. You are encouraged to discuss homework and projects with your classmates. The work you submit, however, must be your own. Good scholarship requires that all collaboration must be acknowledged. If you collaborate on the solution of a problem set or project, I expect that you list your collaborators. Additionally, whenever you use a source in any way, that usage must be documented in the assignment turned in. Sources include books, articles, magazines, the Internet, and communication with other people.

Text


This book is hot off the presses, and the closest to an appropriate text for computer vision. However, because the field is so new and quickly evolving, we will also be relying on a number of academic research papers for reading materials.

Schedule

A tentative schedule is available on the course website; this will be updated to include reading assignments.