

## *Applied Mathematics Graduate Project*

*Class Time:* MWTH 5:30-7:50 P.M.

*Class Room:* MH 484 (Session A), MH 380 (Session B)

*Instructors:*

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*Office Hours:* Monday, Wednesday 8-9 pm, Thursday 4:30 – 5:30 pm or by appointment.

*Course Description:*

This course is the capstone experience of the masters in applied mathematics. We will serve as a team of consultants for GE Healthcare with two tasks dealing with time-resolved angiography in magnetic resonance imaging (MRI):

1. Understanding the mathematics of the **H**ighly **C**onstrained **B**ack**p**rojection (HYPR). We are interested in placing this and related algorithms (I-HYPR, HYPR-LR) in a mathematical framework to study their relation to other iterative reconstruction algorithms. We want to understand their resolution, noise amplification and artifacts. This analysis will help GE make a short term decision as to whether they will include this method in the MRI scanners.
2. Understanding how prior information can be incorporated in a mathematical description of the blood vessels being imaged using level-set techniques. We will compare the HYPR technique to a method that evolves the surfaces of vessels until they best match the data. This comparison is a long term goal of GE and Dr. Pineda in terms of finding the optimal way of using prior information for reconstruction with limited data.

*Course Homepage (Blackboard):*

- *Email:* make sure that your email on Blackboard is one that you check regularly. Homework assignments, announcements and other class related information will be sent via email.
- *Course Documents:* documents related to the course will be posted here.
- *Discussion Board (under communication tool):* this online forum allows for students and faculty to communicate about the course (anonymously if desired).

*Grading:*

Major Project Reports to GE (Presentation and Written)

Midterm Report	Final Report
Monday June 23	Friday August 8

Internal Weekly Presentations of Group Progress

There will be a final presentation on Thursday August 7, 2008 by the students to the instructors. The deliverables to GE will be a written report, a presentation and all of the code (in MATLAB) we used to generate the results.

Letter Grades for each students will be assigned after the Final Report (presentation and written) have been submitted. One letter grade will be based on the degree of satisfaction from our client (GE Healthcare) and this grade will be shared by all students. The second letter grade will be based on class participation, attendance, collaboration, and contribution to the project. The research notebooks and a 1 page description written by the student of their contributions will also be used to assign the final grade. In the case that the final report is not completed, a grade of incomplete will be assigned.

### *Suggestion and comments*

- This project will consist of a real consulting experience which by its nature is subject to change. We will be responsive to our clients needs and will be flexible. As opposed to other courses where the emphasis is on giving the right answers, this course is about asking the right questions.
- Unlike other courses where your instructors have the answers and are testing you, in this course, the instructors are simply more experienced members of the team who will help guide the work. We don't have all the answers!
- The course will involve reading papers, asking questions, writing code, and sharing your results with the team and with our clients.
- Make sure to ask questions and offer comments as this will make the team stronger.
- Write all your computations in your research notebook and date them. This will make it easier later when writing the reports. Try writing sections of the report as you go if possible.
- We are a team. Our success depends on all of us working well together.

### *Academic Integrity*

Students who violate university standards of academic integrity are subject to disciplinary sanctions, including failure in the course and suspension from the university. Since dishonesty in any form harms the individual, other students and the university, policies on academic integrity are strictly enforced. I expect that you will familiarize yourself with the academic integrity guidelines found in the current student handbook:

<http://www.fullerton.edu/deanofstudents/judicial/policies.htm>

Examples of actions that constitute academic dishonesty include, but are not limited to:

- Unacceptable examination behavior – communicating with fellow students, copying material from another student's exam or allowing another student to copy from an exam, possessing or using unauthorized materials, or any behavior that defeats the intent of an exam.
- Plagiarism – taking the work of another and offering it as one's own without giving credit to that source, whether that material is paraphrased or copied in verbatim or near-verbatim form.
- Unauthorized collaboration on a project, homework or other assignment where an instructor expressly forbids such collaboration.

### *Emergency Evacuation*

In the event of an emergency such as an earthquake or a fire:

- Take all your personal belongings and leave the classroom. Use the stairways located at the east, west or center of the building.
- Do not use the elevator. They may not be working once the alarm sounds.
- Go to the lawn area towards Nutwood Avenue. This provides a safe distance from falling debris from buildings. Stay with class members.
- For additional information on exits, fire alarms and telephones, building evacuation maps are located near each elevator.
- Anyone who may have difficulty evacuating the building, please see instructor.

*The material in this syllabus may be changed at the instructors' discretion*