

Final Project Proposal Instructions

Special Topics in Signals & Systems: Biomedical Imaging
ECEn 682R, Section 3

Due: Project proposals are due 11/10/2009 by midnight in the box outside Dr. Bangerter's office.

Description:

A full 25% of your grade in this class will be based on your final project. Significant long-term learning can come from the process of researching a topic in depth, possibly performing simulations or derivations, and then preparing to present your results or what you have learned in a way that teaches others. What you get out of the final project (and ultimately this course) will be strongly correlated with how much thought and effort you put into the final project.

I am leaving the topic and structure of the final project very open to encourage each of you to focus on an area of interest to you. The project needs to relate to one of the major imaging modalities (projection radiography, CT, MRI, ultrasound, or nuclear imaging), and should require a minimum effort of approximately 20-25 hours per team member over the final 4 weeks of class. Some acceptable sample topics would include:

- In depth study of the physics, instrumentation, or engineering background/challenges associated with one of the imaging modalities. (This would be particularly useful if you are interested in one of the modalities that we've skimmed through in class, e.g. nuclear imaging or ultrasound.)
- Implementation and comparison of some image reconstruction techniques. For example, a group might choose to implement a simple filtered back-projection technique for CT, a filtered back-projection technique that compensates for fan beam geometry, and a 2D Fourier transform based technique that grids the data onto a Cartesian grid for reconstruction, and then compare each technique for computational efficiency and reconstructed image quality. I can help provide sample data for these types of projects. (I've got suggestions for lots of these types of projects, many in MR, so come talk to me if you are interested.)
- A deep dive into a particular current research topic, usually focusing on a paper or group of papers in the literature. This deep-dive may or may not include simulations, depending on the topic and time constraints. Some interesting sample topics: compressed sensing in MRI (i.e., reconstruction of MRI images from massively under-sampled datasets by exploiting sparsity), diffusion-weighted MRI, functional MRI and the BOLD contrast, hybrid CT/MRI systems, MR-guided high-intensity focused ultrasound, coronary CT angiography, and many others. Come see me and I can point you to papers and topics that might be of interest.

Group projects are encouraged, but groups should consist of not more than 3 people. (If you have a proposal idea that has well-delineated areas for more than 3 people, come talk to me and I'll consider it.)

Project Proposals:

Your proposal should include a title for your project, the names of students to be involved, and 2-3

paragraphs describing the work that will be performed. If the project involves a deep-dive into specific articles or papers, please provide a list of these references in the project proposal. If any simulations or experiments are to be performed, outline what they are, how they will be accomplished, and what results are expected. Please prepare these electronically, and limit them to one page or less. **I am available to give you ideas. Please come to office hours if you would like to discuss.**

Final Deliverables:

You will be required to prepare a **10-12 minute slide presentation** to be presented in class 12/3, 12/8, or 12/9. A **3-5 minute question period** will follow your presentation, when you will field questions from the class and me about your topic. These should be polished and well-prepared presentations, equivalent to what you might prepare for a scientific conference.

In addition to the final presentation, you will need to hand in a **2-3 page final report** on your project. This should include enough detail to help me ascertain the work that was performed. Any simulation or experimental results should be included in the report. If the project consisted of a deep-dive into a particular topic area, the final report should have more of a “review paper” feel to it. If working in a group, please indicate which sections of work were performed by whom.