BE280A, Principles of Biomedical Imaging 11/17/14
Fall Quarter 2014

BE280A Final Project Assignment

Due Date: Final project presentations will be given on Tuesday, December 16, 2014 from 11:30 am to 2:30 pm.

Overview and General Guidelines:

1) Select one of the project options from below.
2) Please work with 1 partner (preferred) or on your own.
3) Each group should be prepared to give a 15 minute presentation with 5 additional minutes allotted for questions. (this may be adjusted depending on the number of groups)
4) Send an e-mail to the instructor (ttliu@ucsd.edu) indicating your choice of project and the name of your partner (if applicable) by 10 am on Wednesday, November 26, 2014.
5) Be prepared to submit an electronic version of your presentation on a thumb drive before the end of the session.

Option 1

For this option, you will design your own project that is related to the course material. Some examples include: (1) analysis of an RF coil design from a published journal paper; (2) analysis of an MRI method or pulse sequence from a published journal paper; (3) projects from prior years (these can be seen by starting at the course website browsing back through the web pages from prior years; e.g. http://cfmriweb.ucsd.edu/ttliu/be280a_05/BE280A_05_project.pdf). Potential past projects include: 2010 midterm project on CT; 2006/2007/2008 final project on echoplanar imaging; 2005 final project on parallel imaging); (4) application of CT or MRI to an interesting clinical or research problem.

Guidelines:

(a) You will need to obtain prior approval for your project from the course instructor by Wednesday, November 26, 2014. Provide a short description (< 1 page) of what you plan to do, including what papers you are planning on looking at (if applicable).
(b) Make sure to use course concepts in your presentation and provide enough background material so that your fellow students can follow the presentation.
(c) Grading criteria: clear connection to course content and sufficient coverage of the necessary background material (30 pts); (ii) accuracy and clarity of concepts introduced (50 pts); (iii) quality of presentation (20 pts).

Option 2 (Limited to 2 groups)

The goal of this project is to create a short presentation that explains key concepts of magnetic resonance imaging (MRI). Your target audience member is a first year graduate engineering student who knows very little about either Fourier transforms or MRI. The presentation should be technically accurate, concise, and engaging. Rehearse your presentation so that you can meet the time limit!

The required components of the presentation are as follows:

a) Explain how one can make up an image from its Fourier components.

b) Explain the notion of k-space.
c) Go over precession in the presence of a magnetic field, the concept of a rotating frame, and the importance of spin phase.
d) Explain how the use of gradients in MRI enables us to form an image.
e) Address aliasing and resolution requirements.
f) Provide an example of at least one MRI pulse sequence.
g) Cover one additional aspect of MRI that you think is important.

Additional notes:

1) The presentations will be graded using the following criteria: (i) coverage of all required elements (20 pts); (ii) accuracy and clarity of concepts introduced (60 pts); (iii) quality of presentation (20 pts);
2) Discussion of **general ideas** is encouraged between groups, however, each presentation submitted should reflect each group's own understanding of the material. MATLAB code should be **unique** to each group. Significant discussions with other groups should be given appropriate credit (e.g. we discussed part (a) with so and so).
3) It is recommended, although not required, that you use MATLAB or some other software package to create animations and simulations. You may find it useful to adapt some of the MATLAB exercises you did for the homeworks.
4) You may NOT use pre-existing movies, unless they demonstrate a physical phenomenon that is not easy to recreate on your own (e.g. a movie of a metal object being pulled into a magnet). If you use a scene from a pre-existing video, please make sure to cite the source.
5) Where appropriate, title and label the axes on plots and images in your presentation.