

Medical Physics 710 / BME 710 - Guidelines for the Semester Project

Semester Projects:

The goal for the semester project is to conduct an independent MRI research project. This does not need to be novel, but should emphasize some aspect of MR physics. It could be scanner-related experiments, computer simulations, image reconstruction algorithms, or hardware design. Potential projects include writing simulation software regarding aspects of data acquisition or image reconstruction, develop or learn to use software for Bloch simulators, generating RF pulses, fMRI, or DTI analysis (or similar), or constructing or modifying hardware such as an RF coil. MR data sets can be provided by the instructor per request for simulation or image reconstruction projects. Access to a shop or dedicated hardware such as a spectrum analyzer, scanner for image acquisition, etc. might be possible through the instructor also.

Please **do not simply pursue a project directly related to previous, ongoing or thesis-related MRI projects.**

Some examples from previous years:

- Design and QA of a single loop receiver coil
- Simulation of combined stimulated and spin echoes for accelerated T2-weighted imaging.
- Computational Simulations of Grid-tagging Technique
- RF Pulse Design - The Shinnar- Le Roux algorithm
- Diffusion Tensor Imaging - Image acquisition
- Compare T1 mapping methods
- Muscle Velocity and Inertial Force Measurements from Phase Contrast MRI
- Reconstruction
 - Cardiac Imaging: cine reconstruction
 - MR Elastography
 - geometric distortion corrections of EPI data
 - comparing various time-resolved CE MRA techniques
 - Off-resonance Correction of Two-dimensional Radial MRI
- Parallel Imaging
 - Comparing SENSE and GRAPPA in simulations and with real data
 - Implementing SPIRiT (Compressed Sensing and Parallel Imaging for radial acquisitions)
- Compressed sensing-based reconstruction of magnetic resonance images

Important Dates

October 31st: Project proposal is due - please submit to Box at Learn@UW

December 7th and 12th: Oral presentations of all students

December 17th: Written report due

December 19th: Review of classmates report is due (homework #8)

Late submissions for the report and the review will result in point deductions

Proposal

The proposal should outline the project you want to tackle and provide some specifics on the goals and endpoints of the proposed work. What are the objectives of the work? What are the methods to achieve the objectives? Be specific: e.g. what kind of software tools will you be

using (Matlab, C code, ...). What kind of data will you be using and were to you plan to get these from? Will you use tools that are available online or elsewhere?

A half page proposal should be appropriate in most cases. You might want to add 2-4 key references that describe the problem you are addressing or methods that you are going to implement.

Oral Presentation

The oral presentations will be in 'ISMRM format' where every presenter will have 9 minutes for his talk with a subsequent question&answer session with the audience. Look at it as a good opportunity for getting familiar with such a conference style presentation. You should stay within your 9 minute time slot and points will be deducted if your presentation is outside an 8-10 min bracket.

Some tips that you might (or might not) want to follow:

- Speakers vary in the amount of slides they go through in a 9 min presentation. It depends on how fast you talk and how packed your slides are, but targeting between 8 and 14 slides seems reasonable for most. Include a Title slide and Summary or Conclusion slide. In a 9 min talk, a 'outline slide' is not necessary but optional.
- It is highly recommended that you practice and time your talk to yourself or somebody else and time it to make possible adjustments. For many, the presentation time is different when speaking out loud compared to speaking it quietly or in your head. · Here is a link to the ISMRM 2008 Annual Meeting Guidelines for Presenters in Oral Sessions with some additional advice <http://www.ismrm.org/08/oral.htm> . Familiarize yourself with these instructions. Please note that you do not have to include a 'declaration of financial interests or relationships' for this class presentation. The link for the 2017 ISMRM presenter guidelines can be found here: <https://www.ismrm.org/2017-annual-meeting-exhibition/2017-guidelines-for-presenters-posters/>, but it does only cover technical aspects, not advice on the contents.

Written Report

- Please submit the final version of the report to the dropbox on the Learn@UW course webpage in word and pdf format. You have two options to choose from for the submission/style format:· The IEEE Engineering in Medicine and Biology Society format with a four page limit (<http://embs.paperecept.net/conferences/support/word.php>). This file will be formatted like it would be printed with figures embedded in the manuscript. You can find a word template file on the IEEE website as well as on the course homepage. The final document can not exceed 4 pages.
- JMRI - technical note format
([http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1522-2586/homepage/ForAuthors.html](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1522-2586/homepage/ForAuthors.html)): This webpage also has a link to 'Common Mistakes Authors Make', which I find worth checking. The JMRI style is intended for a manuscript submission. Some features include: (1) figures are attached at the end of the file and (2) double line spacing for the review process. As stated in the instructions, the document is limited to : up to 10 manuscript pages (2,500 words), 20 references, 5 figures and tables. The references and figures and tables are not counted in the 10 page limit.

Make yourself familiar with the document requirements for the IEEE and JMRI submissions and choose the one you prefer. Don't be fooled by the page limits (4 for

IEEE and 10 for JMRI) the actual word count is likely to be similar. Follow the style guides in terms of formatting (page size, margins, headings, reference style, units etc.)

Review

You will be assigned to review a classmates report as a 'mock review experience' for a manuscript submission. Put yourself in the position of a reviewer and write a review addressed to the author of the manuscript. Similar to a journal review process, this review will remain anonymous. In other words, your classmate will never know who wrote the report pertaining to his or her project. For this purpose, please send your review directly to Andy and me via e-mail. The review will be part of your homework grade, not the project grade. The review should not exceed one page. Some topics you might want to cover in the review are

- What did you like / what did you not like about the report.
- Was the material clearly presented (quality of figures, structure of the document, etc.)? · What do you think of the science? Is it a well conducted experiment? Do you see some flaws or shortcomings? Is it novel? Does the discussion adequately cover potential limitations of the study?
- Does the introduction adequately cover the objective of the manuscript and related work?
- Were the key references included or are some missing that you consider crucial for this topic.
- Are the methods described such that they are reproducible?
- Did the authors follow the submission guidelines (style / reference format / page limits)
- Are there substantial typos or grammatical errors?
- When criticizing aspects of the report, try to be constructive.

It can be very helpful to keep these criteria in mind when you write your own report for this class and when you work on future manuscripts.