ENGG*6560 Advanced Digital Signal Processing

School of Engineering
University of Guelph
Winter 2013

Instructor:
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Schedule:
TBD

Course Description:
This course will cover the following material concerning adaptive filters:
Review of discrete-time signal processing, stochastic processes and spectrum analysis, Wiener filters, linear prediction, Kalman filters, LMS and RLS filters, blind deconvolution.
The following material concerning multiresolution (wavelet) analysis will also be covered:
Time-frequency analysis, wavelet bases, wavelet packets, local cosine bases, lapped transforms, transform coding.

Course Objectives:
By completion of this course, you should be able to:

• Identify criteria for filter performance measures
• Express optimality criterion for filter design
• Use various optimality criterion to design filters
• Compare and contrast the various optimality criteria
• Define time-frequency analysis
• Use wavelet basis functions to perform multi-resolution decomposition
• Identify different multi-resolution approaches
Reference Texts:

Evaluation:
- Computer Labs/Assignments: Four (4) 60%
- Term Project: One (1) 40%

Tentative Topics:
- Review of DSP
- Stochastic processes and spectrum analysis
- Wiener filters
- Linear prediction
- Kalman filters
- Least mean squares (LMS) filters
- Recursive least squares (RLS) filters
- Blind deconvolution
- Time-frequency analysis
- Wavelet bases
- Wavelet packets
- Local cosine and lapped bases
- Transform coding
Purpose

The purpose of the term project for this course is to allow you to extend the course material in an independent project. This can be accomplished in two ways: the project can involve the application of the course material to a research topic of your choice or the project extends the course material to more advanced topics. In either case, incorporating the course material into some aspect of your graduate research is encouraged.

Proposal

A two page project proposal is as noted above. Although the proposal will not be formally graded, it is a requirement for the project. The proposal will give the problem statement, background (including brief literature review), proposed method, and anticipated results and contributions. The two page limit is inclusive of figures.

Report

The report for this project should be of a format and style suitable for submission to IEEE Transactions on Signal Processing. The IEEE Signal Processing Society’s site for the journal is: http://www.signalprocessing.org/publications/periodicals/tsp/
See the IEEE Transactions authors’ web sites for detailed format instructions at: http://www.ieee.org/web/publications/authors/transjnl/index.html.
I will only accept electronic versions via email in Adobe Portable Document Format (PDF). I strongly recommend you produce the document using \LaTeX.

**Presentation**

A portion (20%) of the report’s grade will be for an oral presentation to be given on the last day of classes in front of the class. The presentation will be of 20 minutes in length including allowing for 5 minutes of questions. You will stopped at 20 minutes whether or not you have finished. You be penalized for presentations that do not allow time for questions. I will provide a projector and computer with USB port. Have printed copies of the slides to hand out during the presentation and give me an electronic version.

Some presentation guidelines:

- do not read from your slides or memorize the exact words of the presentation
- use large fonts with plenty of “white space” (e.g. point form with space between points) to make the slides more readable
- some recommend at most 5 points per slide, covering about one minute’s worth of material
- the slides need not contain every minor piece of information – it is more important that they be easily readable by the audience.
- graphs and figures convey far more information to the audience than equations
- practice, practice, practice!