Syllabus: Inverse Theory and Parameter Estimation
Fall 2008

Classes: 10.30 – 12 pm Tuesday and Thursday in seminar room. 26 classes.

Grading: Analytic mathematics and Matlab coded exercises (80% grade) and comprehensive final (20%). Weekly homework assigned on Monday and due following Monday (11 total homeworks). LABEL homework problem and plots very well and attached the generating code.

Book: Parameter Estimation and Inverse Problems, Rick Aster et al.
Errata: http://www.ees.nmt.edu/Geop/Classes/GEOP529_book.html
CDROM: Matlab examples done in book.

Regularization toolbox: http://www2.imm.dtu.dk/~pch/Regutools/regutools.html
Matlab tutorials: http://math.ucsd.edu/~driver/21d-s99/matlab-primer.html

Prerequisites: Linear algebra and computational matrix algebra. Simple probability theory and statistics. Vector calculus. Fourier transforms. Programming with MATLAB very helpful.

Sharing code policy: you only learn to code algorithms if you do it yourself. Working together is encouraged, albeit turning in someone else's code with a few minor changes will only hurt you in the long run.

Outline

1. Introduction
2. Linear algebra review
3. Probability and statistics review
4. Vector calculus review
5. Linear regression (2)
6. Discretizing inverse problems (2)
7. Rank deficiency and ill conditioning (2)
8. Tikhonov Regularization (2)
9. Iterative methods (2)
10. Additional regularizations (1)
11. Fourier techniques (1)
12. Bayesian methods (2)
13. Review for final