

CAS MA539 – Methods of Scientific Computing

Boston University, Fall 2005

Final Project.

(Due Monday, December 12)

In lieu of a final exam for this course, you are asked to complete a final project. The grade for this project will contribute 30% to your overall grade for the course. Simply put, you are asked to select a mathematical problem of interest to you that requires your learning a new methodology (i.e., not explicitly explored in class or homeworks), understanding a published algorithm for implementing this methodology, and evaluating the algorithm yourself by coding it within a software environment of your choice and exploring its performance through the use of informative test cases.

A brief outline of what is looked for in this project follows.

1. As the total possible credit for this assignment is roughly three times that of any one homework assignment, you should use that as a *rough* guide in judging the depth and magnitude of what is being asked here.

Examples of project topics from past years include the discrete wavelet transform and applications, the fast Fourier transform and applications, more advanced topics in the numerical solution of differential equations, cubic smoothing splines for function estimation, generation of pseudo-random numbers, the EM algorithm, and more.

2. The end product of your work should be a final report (probably 10-15 pages, including figures and/or tables). This report should be reasonably formal in nature (consult a journal of your choice for standard organization of technical papers, if you are not familiar with this style). Included should be
 - (a) One-paragraph abstract, providing an overview of what you have done.
 - (b) Introductory section, providing any background on the topic area that you feel a general reader may require. [Note: Do **not** simply assume that the instructor is intimately familiar with your topic area.]

- (c) Section explicitly dedicated to description of the methodology and algorithm with which you chose to work.
- (d) Section in which you present and discuss the examples you have chosen to use for testing your implementation.
- (e) Conclusions.
- (f) Appendix containing code, figures, and tables, all labeled and commented appropriately.

IMPORTANT:

As a precursor, I would like to see a short project “proposal” from each person, by Friday, November 4. This should be no more than a page in length, describing to me the topic you have selected and, very importantly, citing a reference or two from which you will be working. I will then plan on returning these to you within a week afterwards, and working with you to modify any details as necessary. The end result should be that you have roughly a month during which you may work on your project.