



SIMON FRASER UNIVERSITY
MATHEMATICS

MACM 409 - 3

Numerical Linear Algebra: Algorithms, Implementation and Applications

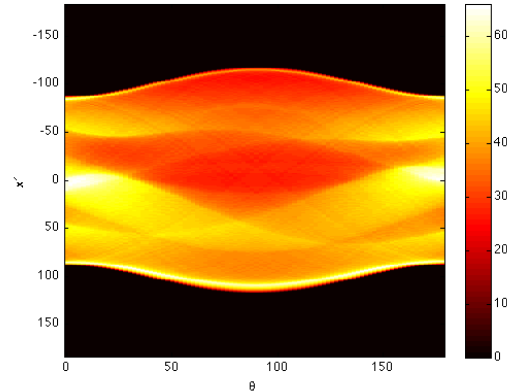
Section: D100 - 2013 Fall

Instructor: Manfred Trummer

Description Topic:

Calendar Description:

Development of numerical methods for solving linear algebra problems at the heart of many scientific computing problems. Mathematical foundations for the use, implementation and analysis of the algorithms used for solving many optimization problems and differential equations.



Who should take this course?

*The course is aimed at students interested in scientific computing and modeling. Along with an introductory numerical analysis course, this is a *foundational* course. If you are interested in using mathematical or statistical tools for simulation, then you will need tools from numerical linear algebra. When you search on Google, you use numerical linear algebra. If you get a PET scan, numerical linear algebra is needed to get an image.*



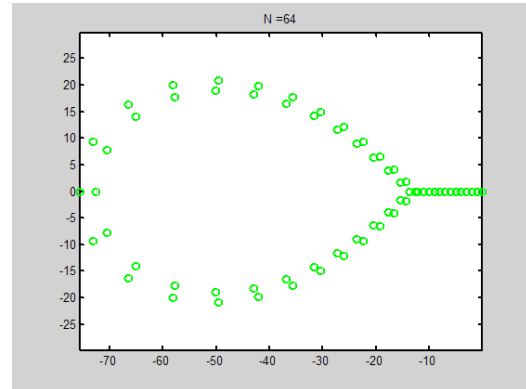
What material will you see in this class?

We will cover a variety of topics in contemporary numerical linear algebra and its applications. We will develop, analyze and implement a range of algorithms and see how they work in practice and theory. We program and test our methods in Matlab – no prior knowledge of Matlab is assumed. Confirmed topics are an introduction to Matlab, a quick refresher of linear algebra, direct methods for solving linear systems, QR factorization, least squares methods, and iterative methods for computing eigenvalues.

Possible other topics are the conjugate gradient

method and other Krylov type methods, singular value decomposition, curve fitting, numerical optimization, iterative methods for image reconstruction (ART and MLEM), and the Kalman filter.

| <i>GRADING</i> | |
|-------------------------------|-------------------|
| <i>“Homework Zero”</i> | <i>10%</i> |
| <i>Homework</i> | <i>25%</i> |
| <i>Midterm</i> | <i>15%</i> |
| <i>Final Project</i> | <i>10%</i> |
| <i>Final Exam</i> | <i>40%</i> |



Required Text:

Numerical Linear Algebra,
Trefethen and Bau,
SIAM978-0896713619

Recommended Text:

Material List:

Prerequisite/Corequisite:

Prerequisite: MATH 251, MACM 316, programming experience.
Quantitative.

Notes:

THE INSTRUCTOR RESERVES THE RIGHT TO CHANGE ANY OF THE ABOVE INFORMATION.

Students should be aware that they have certain rights to confidentiality concerning the return of course papers and the posting of marks. Please pay careful attention to the options discussed in class at the beginning of the semester.