

CS 372/CM 372

Numerical Linear Algebra

Winter 2006

Instructor: Justin Wan Office: DC3625 Email: jwlwan@uwaterloo.ca
Classroom: MWF 11:30-12:20 MC 4060
Web Site: www.student.cs.uwaterloo.ca/~cs372/

Numerical linear algebra techniques have been used in many areas:

- Image Processing
- Search Engine
- Computational Finance
- Design of Aircraft

The vast majority of the computational work in the above problems is spent on solving linear systems, least squares problems, eigenvalue and singular value decompositions.

Topics covered include:

C++ Object-oriented linear algebra library using C++. Pointers and dynamic memory allocation. Operator overloading. Templates. Class and objects.

Solving Linear Systems LU factorization, Cholesky factorization. Special matrices: tridiagonal, band.

Least Squares Problems Pseudo inverse. QR factorization. Householder transform, Givens rotation.

Eigenvalue Problems Eigenvalues and eigenvectors. Characteristic polynomials. Schur form. Power iteration, inverse iteration. QR method. Jacobi, divide-and-conquer.

Singular Value Decomposition Bidiagonalization. Search engine.

Course Evaluation

The evaluation for this course will be made on the basis four assignments, a midterm and a final examination. The assignments will require C++ programming. The four assignments allow students to build their own linear algebra library.

Prerequisite

It will be assumed that the student has completed an introductory course in numerical computation (i.e. CS 370 or equivalent).

More information

Contact Justin Wan, DC3625, jwlwan@uwaterloo.ca.