

Iterative Methods for Linear Systems of Equations

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Informatics and Mathematical Modelling (IMM), DTU, Denmark

Course description

The PhD course gives an overview of modern iterative methods for solving large systems of linear equations. Such systems arise in a variety of applications such as image processing, data mining, medical and geophysical tomography, geodesy and computational nano-science.

The purpose of this course is to present state-of-the-art methods for such systems, with emphasis on a combination of practical computational aspects and insight into the underlying theory for the methods.

Course requirements

The participants must have a fundamental knowledge of numerical analysis and linear algebra and must be able to program in Matlab. Students are expected to read the course material before participating in the course.

Day 1 Introduction to iterative methods

Simple iterative methods (Jacobi, Gauss Seidel, SOR), simple iterative methods for the normal equations (ART, SIRT) and one-dimensional projection methods.

Day 2 Projection methods (1)

Lanczos based methods for symmetric systems: CG and MINRES. Methods for the normal equations. Convergence theory.

Day 3 Projection Methods (2)

Arnoldi based methods: GMRES and FOM. Convergence theory. Restarted GMRES, GMRESR.

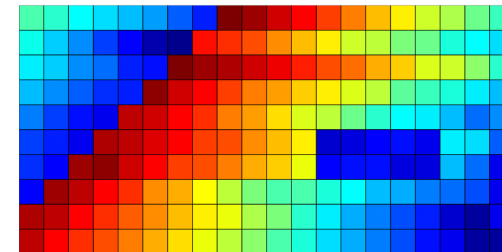
Day 4 Projection Methods (3)

Bi-Lanczos based methods: BI-CG and QMR, Bi-CGSTAB and CGS.

Day 5 Preconditioning Methods

Simple iterative methods as preconditioners. ILU, polynomial preconditioning, EBE, etc.

The course consists of lectures and computer exercises, running each day from 9 a.m. to 4 p.m.



Course evaluation

Final evaluation will be based on a report which is agreed upon during the course and which corresponds to about 30 hours of workload. The report must be handed in no less than 4 weeks after completion of course.

Registration and deadline

Please sign up with Lone Hegelund, IMM: lhe@imm.dtu.dk, no later than October 20, 2006.
Informatics and Mathematical Modelling (IMM): www.imm.dtu.dk.