SCUOLA
NORMALE
SUPERIORE

SEMINARIO DI MATEMATICA

venerdì 12 aprile 2019
ore 11:00

Scuola Normale Superiore
Pisa
Aula Mancini

James Nagy
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Terrà un seminario dal titolo:

"MATLAB Tools for Large-Scale Linear Inverse Problems"

Abstract:
Inverse problems arise in a variety of applications: image processing, finance, mathematical biology, and more. Mathematical models for these applications may involve integral equations, partial differential equations, and dynamical systems, and solution schemes are formulated by applying algorithms that incorporate regularization techniques and/or statistical approaches. In most cases these solutions schemes involve the need to solve a large-scale ill-conditioned linear system that is corrupted by noise and other errors. In this talk we describe and demonstrate capabilities of a new MATLAB software package that consists of state-of-the-art iterative methods for solving such systems, which includes approaches that can automatically estimate regularization parameters, stopping iterations, etc., making them very simple to use. Thus, the package allows users to easily incorporate into their own applications (or simply experiment with) different iterative methods and regularization strategies with very little programming effort. On the other hand, sophisticated users can also easily access various options to tune the algorithms for certain applications. Moreover, the package includes several test problems and examples to illustrate how the iterative methods can be used on a variety of large-scale inverse problems.
The talk will begin with a brief introduction to inverse problems, discuss considerations that are needed to compute an approximate solution, and describe some details about new efficient hybrid Krylov subspace methods that are implemented in our package. These methods can guide users in automatically choosing regularization parameters, and can be used to enforce various regularization schemes, such as sparsity. We will use imaging examples that arise in medicine and astronomy to illustrate the performance of the methods.

This is joint work with Silvia Gazzola (University of Bath) and
Per Christian Hansen (Technical University of Denmark).

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