universität wien

Fakultät für Mathematik

Vortrag
Tenure Track „DATA DRIVEN PARTIAL DIFFERENTIAL EQUATIONS“

Dienstag, 19. März 2019, Besprechungszimmer 02

Lise-Marie Imbert-Gérard
(University of Maryland)

15:00 Uhr – 15:20 Uhr: Didaktischer Vortrag

"Numerical linear algebra for sparse matrices: the Conjugate Gradient method"

Sparse linear systems arise from many practical applications. Among the many methods existing to solve such systems there are two categories: direct and iterative methods. For large sparse linear systems, unless a matrices have a very special structure, iterative methods are the method of choice. In this lecture we will introduce the concept conjugate directions and present the Conjugate Gradient algorithm.

15:50 Uhr – 16:35: Wissenschaftlicher Vortrag

„Variable coefficients and numerical methods for electromagnetic waves“

In the first part of the talk, we will discuss a numerical method for wave propagation in inhomogeneous media. The Trefftz method relies on basis functions that are solution of the homogeneous equation. In the case of variable coefficients, basis functions are designed to solve an approximation of the homogeneous equation. The design process yields high order interpolation properties for solutions of the homogeneous equation. This introduces a consistency error, requiring a specific analysis. In the second part of the talk, we will discuss a numerical method for elliptic partial differential equations on manifolds. In this framework the geometry of the manifold introduces variable coefficients. Fast, high order, pseudo-spectral algorithms were developed for inverting the Laplace-Beltrami operator and computing the Hodge decomposition of a tangential vector field on closed surfaces of genus one in a three dimensional space. Robust, well-conditioned solvers for the Maxwell equations will rely on these algorithms.