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## Mathematical Colloquia

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Monday, 17 May 2021

17:15 h, via Zoom

Dr. Pascal Heid, University of Oxford

# Adaptive iterative Galerkin methods for nonlinear PDE

## Abstract:

A wide variety of (fixed-point) iterative methods for the solution of nonlinear equations (in Hilbert spaces) exist. In many cases, such schemes can be interpreted as iterative local linearisation methods, which can be obtained by applying a suitable linear preconditioning operator to the original (nonlinear) equation. Based on this observation, we will derive a unified abstract framework which recovers some prominent iteration schemes. Furthermore, in the context of numerical solution methods for nonlinear partial differential equations, we propose a combination of the iterative linearisation approach and the classical Galerkin discretisation method, thereby giving rise to the so-called *iterative linearised Galerkin* (ILG) methodology. Moreover, still on an abstract level, based on elliptic reconstruction techniques, we derive an a posteriori error estimator which separately takes into account the discretisation and linearisation error contributions. Subsequently, we propose an adaptive algorithm, which provides an efficient interplay between these two effects. Finally, our abstract theory will be applied to stationary conservation laws, and some numerical experiments will be performed.

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