



Technische  
Universität  
Braunschweig



Vortrag im Gästeprogramm des GRK 2075

## Prof. Gianluigi Rozza

SISSA mathLab, International School For Advanced Studies, Trieste – Italy

### Reduced Order Methods for PDEs: state of the art and perspectives with applications in Industry, Medicine and Environmental Sciences

Donnerstag, 24.01.2019, 10 Uhr  
Institut für Wissenschaftliches Rechnen  
Mühlenpfordtstrasse 23, 8. OG, Raum 812

We provide the state of the art of Reduced Order Methods (ROM) for parametric Partial Differential Equations (PDEs), and we focus on some perspectives in their current trends and developments, with a special interest in parametric problems arising in offline-online Computational Fluid Dynamics (CFD).

Efficient parametrizations (random inputs, geometry, physics) are very important to be able to properly address an offline-online decoupling of the computational procedures and to allow competitive computational performances. Current ROM developments in CFD include: a better use of stable high fidelity methods, considering also spectral element method and finite volume discretizations, to enhance the quality of the reduced model too; more efficient sampling techniques to reduce the number of the basis functions, retained as snapshots, as well as the dimension of online systems; the improvements of the certification of accuracy based on residual based error bounds and of the stability factors, as well as the the guarantee of the stability of the approximation with proper space enrichments. For nonlinear systems, also the investigation on bifurcations of parametric solutions are crucial and they may be obtained thanks to a reduced eigenvalue analysis of the linearised operator. All the previous aspects are very important in CFD problems to focus in real time on complex parametric industrial, environmental and biomedical flow problems, or even in a control flow setting.

Model flow problems will focus on few benchmark, as well as on simple fluid-structure interaction problems. Further examples of applications will be delivered concerning shape optimisation applied to industrial problems.

#### Kontakt

Graduiertenkolleg 2075

Technische Universität Braunschweig

Beethovenstraße 51

38106 Braunschweig

0531 - 391-3668

[grk-2075@tu-bs.de](mailto:grk-2075@tu-bs.de)

[www.tu-braunschweig.de/grk-2075](http://www.tu-braunschweig.de/grk-2075)