# MATHEMATICAL ASPECTS OF ISOGEOMETRIC ANALYSIS

## CARLA MANNI and HENDRIK SPELEERS

Department of Mathematics, University of Rome "Tor Vergata"
Via della Ricerca Scientifica, 00133 Rome, Italy
manni@mat.uniroma2.it, http://www.mat.uniroma2.it/~manni/
speleers@mat.uniroma2.it, http://www.mat.uniroma2.it/~speleers/

**Key words:** Isogeometric analysis, Advanced modeling tools, Mathematical methods

## ABSTRACT

Isogeometric analysis (IgA) is a paradigm designed to bridge the gap between classical finite element analysis (FEA) and computer aided design (CAD). It has the great potential of providing a true design-through-analysis process by exploiting a common representation model.

In the traditional approaches, complex geometries are usually modelled by CAD tools and then converted into a computational mesh needed for the numerical solution of the governing partial differential equations (PDEs). For decades, this process has presented a severe bottleneck in performing efficient simulations. On the other hand, simulation methods that employ the same basis functions for the representation of geometric shapes as in numerical simulations allow from the beginning to eliminate geometry errors. This is accomplished in IgA by employing basis functions more general than in traditional FEA such as B-splines and non-uniform rational B-splines (NURBS) for PDE simulations. This unified concept leads to improved convergence and smoothness properties of the PDE solutions and faster overall simulations.

Besides the successful applications in various areas (from structural mechanics to fluid structure interaction), IgA is rapidly becoming a mainstream analysis methodology and a new paradigm for geometric design. Even though substantial contributions have been obtained in the IgA context over the last years, there are several profound theoretical and practical issues that are not yet well understood and that are currently investigated by researchers in numerical analysis, approximation theory, numerical linear algebra, and applied geometry.

The minisymposium aims to collect recent contributions in the mathematical foundations of IgA. This includes but it is not confined to:

- new techniques for the modeling of complex geometries and integration with analysis;
- fast methods for assembly and solution of IgA linear systems;
- error estimation and adaptive refinement.