Curriculum Vitae et Studiorum – Giancarlo Sangalli – March 31st 2019

Data

Born in Pavia on 29^{th} July 1973.

Academic degrees

28^{th} January 2002:
Ph.D. graduated in Mathematics at the University of Milano, supervisor: Prof. Franco Brezzi;

15^{th} January 1997:
B.S. graduated (cum laude) in Mathematics at the University of Pavia.

Past and present posts

1/2016–present:
Full Professor in Numerical Analysis at the University of Pavia.

11/2005–1/2016:
Associate Professor in Numerical Analysis at the University of Pavia.

since 2005:
Research associate of I.M.A.T.I. "E. Magenes" – C.N.R., Pavia.

7/2001–10/2005:
Researcher at I.M.A.T.I. "E. Magenes" – C.N.R., Pavia.

Participation to scientific committees and institutions

- since 2019: member of the European Academy of Sciences;
- since 2018: member of the RICAM Scientific Advisory Board;
- since 2017: member of the scientific committee of the Gruppo Nazionale Calcolo Scientifico (GNCS-INDAM);
- since 2015: member of the scientific committee of the Fondazione Alma Mater Ticinensis;
- since 2015: member of the teaching committee of the Ph.D. program in Mathematics of the consortium: University of Milano-Bicocca, University of Pavia, INdAM, IMATI-CNR;
- since 2011: member of the ECCOMAS Computational Applied Mathematics Committee;

Research grants and contracts

- 2014–2020: principal investigator of the ERC FP7 Ideas Consolidator Grant "HIGEOM – Highly accurate Isogeometric Method";
- 2010–2014: principal investigator of the FIRB (highly-selective young investigator Italian MIUR grant) project "Isogeometric Discretizations in Continuum Mechanics";
- 2012–2016: principal investigator of the industrial research program TOTAL–DS–2753 "Isogeometric Analysis for large deformation incompressible problem" funded by Hutchinson S.A. – Total S.A. (France);

Bibliometrics

- 2019: Included in the list of Highly Cited Researchers, by Clarivate/ISI;
- `http://www.researcherid.com/rid/B-7186-2011` (H-index: 28)
- `https://scholar.google.it/citations?user=DTsd9jYAAAAJ&hl=en` (H-index: 36)

Research activity

Sangalli's primary interests are related to the Finite Element Method (FEM), one of most widely used methods to numerically solve problems in the applications that can be written in terms of partial differential equations, and to its variants.Sangalli's expertise covers the foundations, the theoretical analysis, and the application of various kinds of FEM to several interesting real-life problems: fluid-dynamics, advection-diffusion, linear elasticity, magnetostatic, plates and shells, fluid-structure interaction, etc.
He has worked on multiscale numerical methods, domain decomposition methods, stabilized finite element methods, and, especially, on the IsoGeometric Method (IGM).
The IGM addresses the interoperability between Computer Aided Design (CAD) and numerical simulation of PDEs. CAD software, used in industry for geometric modeling, typically describes physical domains by means of Non-Uniform Rational B-Splines (NURBS) and the interface between CAD output and classical numerical schemes calls for expensive re-meshing methods that result in approximate representation of domains. IGMs are NURBS-based schemes for solving PDEs whose benefits go beyond the improved interoperability with CAD. Indeed, they provide a substantial increase of the accuracy-to-computational-effort ratio and, thanks to the use of high-degree smooth NURBS within the numerical scheme, they outperform classical numerical schemes in most academic benchmarks. However, the mathematical understanding of the IGM is still incomplete and likely we are far from exploiting its full potential. The use of higher-degree IGM for real-world applications asks for new tools allowing for the efficient construction and solution of the linear system, time integration, flexible local mesh refinement, and so on. Sangalli's research activity is aimed at providing the crucial knowledge to further develop the IGM into a highly accurate and stable methodology, having an impact in the field of numerical simulation, particularly when accuracy is essential both in geometry and fields representation.
In particular, research activity by Sangalli and colleagues covers:
- theory of spline/NURBS spaces (high-degree splines, hierarchical splines, T-splines)
- design of spline spaces for complex geometries (multipatch, trimming, software interface to solid modelers)
- stability and well-posedness of IGMs for various class of applications: solid mechanics, contact problems, fluid dynamics, electromagnetism (De Rahm compatible splines).
- IGM parallel and scalable solvers, based on domain decomposition methods
- adaptive method for IGM based on hierarchical splines and T-splines

Selected Papers

[1] A. Collin, G. Sangalli, T. Takacs, *Analysis-suitable G^1 multi-patch parametrizations for C^1 sogeometric spaces*, Computer Aided Geometric Design, Vol. 47, pp. 93-113, 2016

[2] F. Auricchio, L. Beirao da Veiga, T.J.R. Hughes, A. Reali, G. Sangalli, *Isogeometric collocation for elastostatics and explicit dynamics,* Computer Methods in Applied Mechanics and Engineering, Vol. 249-252, pp. 2-14, 2012

[3] L. Beirao da Veiga, A. Buffa, J. Rivas, G. Sangalli, *Some estimates for h-p-k-refinement in Isogeometric Analysis,* Numerische Mathematik Vol. 118 (2), pp.271-305, 2011

[4] A. Buffa, G. Sangalli, R. Vazquez, *Isogeometric analysis in electromagnetics: B-splines approximation,* Computer Methods in Applied Mechanics and Engineering, Vol. 199 (17-20), pp. 1143-1152, 2010

[5] T.J.R. Hughes, G. Sangalli, *Variational Multiscale Analysis: the Fine-scale Green's Function, Projection, Optimization, Localization, and Stabilized Methods,* SIAM J. Numer. Anal., Vol. 45 (2), pp. 539-557, 2007.

[6] Y. Bazilevs, L. Beirao da Veiga, J.A. Cottrell, T.J.R. Hughes, G. Sangalli, *Isogeometric analysis: approximation, stability and error estimates for h-refined meshes,* Math. Models Methods Appl. Sci., Vol. 16 (7), pp. 1031-1090, 2006.

[7] F. Brezzi, G. Hauke, L.D. Marini, G. Sangalli, *Link-Cutting Bubbles for the Stabilization of Convection-Diffusion-Reaction Problems,* Math. Models Methods Appl. Sci., Vol. 13 (3), pp. 445-461, 2003.

[8] G. Sangalli, *Capturing small scales in elliptic problems using a Residual-Free Bubbles Finite Element Method,* Multiscale Modeling and Simulation: A SIAM Interdisciplinary Journal, Vol. 1 (3), pp. 485-503, 2003.

[9] G. Sangalli, *Global and local error analysis for the Residual-free Bubbles method applied to advection-dominated problems,* SIAM J. Numer. Anal., Vol. 38 (5), pp. 1496-1522, 2000.