Andrea Bressan

Curriculum Vitae

ORCID-ID: 0000-0003-3730-668X
Scopus-ID: 53663195600
Google-Scholar-ID: Mcau3BUAAAAJ

February 2025

Research interest:

Numerical methods for PDEs, IsoGeometric Analysis, spline spaces

Professional activities:

02/2021-current	researcher at IMATI, CNR
03/2019-01/2021	RTDA fellow Department of Mathematics, university of Pavia
10/2016-01/2019	postdoctoral fellow Department of Mathematics, university of Oslo in the framework of the FP7 project *"FEEC-A"*
06/2016-09/2016	collaborator of IMATI CNR in Pavia
01/2015-04/2016	research assistant at the Institut für Angewandte Geometrie, University of Linz in the Marie Curie framework for the FP7-PEOPLE-2012-IAPP project *"EXAMPLE"*
01/2014-12/2014	research assistant at the Institut für Angewandte Geometrie, University of Linz in the frameworks of the FWF-NFN project *"Geometry + simulation"* and of the FP7 projects *"TERRIFIC"*

Education and Qualifications

2021	Abilitazione Scientifica Nazionale seconda fascia, settore 01/A05 Analisi Numerica	MIUR
2013	PhD dissertation on *"Spline spaces in IsoGeometric Analysis"*	University of Pavia
2009	Laurea specialistica in matematica, 110/110 dissertation on *"Elementi isogeometrici per il problema di Stokes"*	University of Pavia
2005	Laurea triennale in matematica, 109/110 dissertation on *"Attrattori strani e sistemi caotici"*	University of Pavia

Research projects

2023-	PRIN-*COSMIC*	IMATI-CNR, University of Pavia, University of Firenze
	role:	*IMATI unit leader* and *vice principal investigator*
2022-	PNRR-*RAISE*	IMATI-CNR, University of Genova for (WP2)
	Spoke 3	*Sustainable environmental caring and protection technologies*
	work-package 2	*Smart technologies for environmental monitoring and territory management*
2023-	PRINN-PNRR	UQ and modeling of landslide risk in Liguria administrative region
	role:	*researcher*
2020-2022	*CE4WE*	Regione Lombardia, University of Pavia Modeling of groundwater flow in the Ticino valley
	role:	*researcher*

Consulting

2019-2020	*MuFloT*	Eni, University of Pavia analysis of numerical schemes for CO_2 sequestration
	role:	*researcher*

Research visits

2024	TU Delft
	Deepesh Toshniwal on spline complexes
invited talk:	*Dimension of piecewise polynomials on the Wang-Shi macroelement*
2018 & 2019	ETH & Zurich
	short visits with Christof Schwab on spline approximation
2012/09-2012/12	CMA & SINTEF, Oslo
	with Tom Lyche and Tor Dokken on LR-spline approximation
2011/01-2011/07	CMA, Oslo
	with Tom Lyche and Tor Dokken on LR-spline properties

Refereed research papers

1. Bressan, A., Loli, G., Manenti, S., Reali, A., and Sangalli, G. "*An isogeometric shape optimization method for groundwater flow in porous media*". *Comput. Math. Appl.* **162** (2024), pp.104–119.
2. Gatti, F., Bressan, A., Fumagalli, A., Gallipoli, D., Lalicata, L. M., Pittaluga, S., and Tamellini, L. "*Two Nitsche-based mixed finite element discretizations for the seepage problem in Richards' equation*". *Comput. Methods Appl. Mech. Engrg.* **432** (2024), pp.Paper No. 117368, 20.
3. Bressan, A., Floater, M. S., and Sande, E. "*On best constants in L2 approximation*". *IMA J. Numer. Anal.* **41**(4) (2021), pp.2830–2840.
4. Bressan, A. and Lyche, T. "*Local approximation from spline spaces on box meshes*". *Found. Comput. Math.* **21**(3) (2021), pp.807–848.
5. Bressan, A. and Sande, E. "*Approximation in FEM, DG and IGA: a theoretical comparison*". *Numer. Math.* **143**(4) (2019), pp.923–942.
6. Bressan, A. and Takacs, S. "*Sum factorization techniques in isogeometric analysis*". *Comput. Methods Appl. Mech. Engrg.* **352** (2019), pp.437–460.
7. Bressan, A. and Jüttler, B. "*Inf-sup stability of isogeometric Taylor-Hood and sub-grid methods for the Stokes problem with hierarchical splines*". *IMA J. Numer. Anal.* **38**(2) (2018), pp.955–975.
8. Antolin, P., Bressan, A., Buffa, A., and Sangalli, G. "*An isogeometric method for linear nearly-incompressible elasticity with local stress projection*". *Comput. Methods Appl. Mech. Engrg.* **316** (2017), pp.694–719.
9. Bressan, A. and Mokriš, D. "A versatile strategy for the implementation of adaptive splines". In: *Mathematical methods for curves and surfaces*. Vol. 10521. Lecture Notes in Comput. Sci. Springer, Cham, 2017, pp.42–73.
10. Bressan, A., Buffa, A., and Sangalli, G. "*Characterization of analysis-suitable T-splines*". *Comput. Aided Geom. Design* **39** (2015), pp.17–49.
11. Bressan, A. and Jüttler, B. "*A hierarchical construction of LR meshes in 2D*". *Comput. Aided Geom. Design* **37** (2015), pp.9–24.
12. Bressan, A. "*Some properties of LR-splines*". *Comput. Aided Geom. Design* **30**(8) (2013), pp.778–794.
13. Bressan, A. and Sangalli, G. "*Isogeometric discretizations of the Stokes problem: stability analysis by the macroelement technique*". *IMA J. Numer. Anal.* **33**(2) (2013), pp.629–651.
14. Bressan, A. "*Isogeometric regular discretization for the Stokes problem*". *IMA J. Numer. Anal.* **31**(4) (2011), pp.1334–1356.

Conferences, workshops and schools

	2025	
Feb. 5,6	Workshop: Numerical Methods and Techniques for Poroelasticity and Geomechanical Modeling	Milano, Italia
invited talk:	*An isogeometric solver for free-boundary Darcy based on shape optimization*	
Jan. 7-9	GiSmo Developer days and COSMIC meeting 2025	Firenze, Italia
invited talk:	*Overlapping patches for adaptivity*	
	2024	
May. 20-24	Homological Perspective on Splines and Finite Elements	Kelowna, Canada
invited talk:	*On the dimension of the space of C^{p-1} splines of degree p on the Wang-Shi split*	
	2023	
Sep. 11-13	Topology optimization and IGA workshop	Linz, Austria
invited talk:	*A dirty trick*	
Sep. 4-9	UMI 2023	Pisa, Italy
invited talk:	*Tensor B-splines and adaptivity in IGA*	
Jul. 3-7	IGS 2023	Genova, Italy
invited talk:	*A construction of locally-linearly-independent LR-spline satisfying an anisotropic constraint on the space resolution*	
Jun. 18-21	IGA 2023	Lyon, France
invited talk:	*Adaptive IGA with linearly dependent generators*	
May. 29-Jun. 1	HOFEIM	Larnaca, Cypruss
invited talk:	*Anisotropic refinement with LR-splines*	
Feb. 26-Mar. 3	SIAM CSE	Amsterdam, Nederland
invited talk:	*Preconditioners for adaptive splines, or splines for preconditioners?*	
	2022	
Nov. 7-9	IGA 2022	Banff, Canada
invited talk:	*Exploring new adaptivity strategies*	
Sep. 5-9	INDAM meeting *Approximation Theory and Numerical Analysis meet Algebra, Geometry, Topology*	Cortona, Italia
Jul. 5-8	FAATNA	Matera, Italia
invited talk:	*Preconditioners for adaptive spaces, or adaptive spaces for preconditioners?*	
Jun. 5-9	ECCOMAS 2022	LilleStrøm, Norge
invited talk:	*A different take on adaptive splines*	
	2019	
Sept. 18-20	IGA 2019	Münich, Germany
invited talk:	*Spline spaces provide more accuracy per degree of freedom*	
Jul. 14-20	Mathematical Foundations of Isogeometric Analysis	Oberwolfach, Germany
invited talk:	*T-mesh B-spline Approximation*	
Jul. 9-13	SIAM AG 2019	Bern, Switzerland
invited talk:	*Computing the dimension of spline spaces*	
May 28-31	HOFEIM 2019	Pavia, Italia
poster:	*Sum Factorization in Isogeometric Analysis*	

	2018	
Oct. 10-12	IGA 2018	Austin, USA
invited talk:	*Sum Factorization Techniques in IGA*	
Aug. 20-22	BIT Circus	Espoo, Finland
invited talk:	*Best space of a fixed dimension*	
Jul. 16-20	ESI Workshop	Vienna, Austria
invited talk:	*Best approximation space on uniform partitions*	
Jun. 28-Jul. 4.	Curves and Surfaces: 9th International Conference	Arcachon, France
contributed talk:	*High order non tensor product spline approximation*	
Jun. 4-6	FEEC Workshop	Oslo, Norge
invited talk:	*Best space of a fixed dimension*	
Apr. 23–27	IGAA	Delft, Nederland
contributed talk:	*Approximation with locally adaptive spline spaces*	
Jan. 22–26	DREAMS workshop	Roma, Italia
invited talk:	*A symmetry preserving fast assembling strategy for IGA*	
	2017	
Sep. 25–29	ENUMATH	Voss, Norge
Sep. 11-13	IGA 2017	Pavia, Italia
invited talk:	*Local approximation for locally-tensor-products splines*	
Sep. 6-8	IperPv	Pavia, Italia
	2016	
Sep. 13-16	SIMAI	Milano, Italia
invited talk:	*Quasi-interpolants for non-tensor-products splines*	
Jun. 23-28	Curves and Surfaces: 9th International Conference	Tønsberg, Norge
invited talk:	*Experimenting with adaptive spline spaces: an implementation strategy*	
Jun. 5-10	ECCOMAS	Heraklion, Greece
invited talk:	*Adaptive methods for Stokes*	
	2015	
Nov. 24-27	G+SMO workshop	Linz, Österreich
invited talk:	*Combined bases and block-structured problems*	
Aug. 14-17	ICIAM 2015	Beijing, China
invited talk:	*Hierarchical LR-meshes*	
Jun. 1-3	IGA 2015	Trondheim, Norge
invited talk:	*Stability of IGA elements for Stokes based on non-tensor B-spline spaces*	
Mar. 31-Apr. 2	6th NFN seminar	Obergurgl, Österreich
invited talk:	*InfSup stability for IGA Stokes method with hierarchical splines*	
	2014	
Jun. 12-18	Curves and Surfaces: 8th International Conference	Paris, France
invited talk:	*A hierarchical approach to box-mesh construction*	
Apr. 22-25	4th NFN seminar	Obergurgl, Österreich
invited talk:	*A hierarchical approach to box-mesh construction*	
	2013	
May 27-Jun. 1	5th Women in Mathematics Summer School on Mathematical Theories towards Environmental Models	Trieste, Italia
Mar. 20-22	Numerical Approximation of PDEs	Gargnano del Garda, Italia

2012

Jun. 18-22	IsoGeometric Analysis: a New Paradigm in the Numerical Approximation of PDEs	Cetraro, Italia
Jun. 25-28	SIMAI XI congress	Torino, Italia
invited talk:	*An approach to local refinement in IgA: LR-splines*	
May 15	Colloquium Magenes	Pavia, Italia

2011

Feb. 20–25	New Trends in Applied Geometry	Hurdal, Norge
invited talk:	*Stable isogeometric discretizations for the Stokes Problem*	

Teaching experience

2022-spring	teacher	*Approximation of functions and matrices*	PhD. math	University of Pavia
2021-spring	teacher	*Elementi finiti*	M. of math.	University of Pavia
2021-spring	teacher	*Programmazione 2*	B. of math.	University of Pavia
2021-spring	teacher	*Splines: approximation and IGA*	PhD. math	University of Pavia
2020-spring	teacher	*Approximation estimates for spline spaces*	PhD. math	University Linz
		financed Erasmus+ exchange, cancelled due to the COVID19 pandemic		
2020-spring	teacher	*Programmazione 2*	B. of math.	University of Pavia
2019-winter	teacher	*Matematica con elementi di statistica*	B. of chem.	University of Pavia
2019-spring	teacher	*Programmazione 2*	B. of math.	University of Pavia
2019-spring	teacher	*Metodi numerici con laboratorio di informatica*	B. of chem.	University of Pavia
2015-winter	teacher	*Adaptive spline refinement*	PhD. math.	University of Linz
2010-spring	assistant	*Analisi Matematica C*	M. of eng.	University of Pavia
2009-winter	assistant	*Analisi Matematica 1*	B. of eng.	University of Pavia
2007-spring	tutor	*Geometria 2*	B. of math.	University of Pavia
2006-winter	tutor	*Matematica e Statistica applicate alle Scienze Naturali*	B. of nat.sci.	University of Pavia

Supervised thesis

2022-2024	Alen Kushova	Dottorato in matematica e statistica	Università di Pavia
	Isogeometric discretizations of evolutionary equations and fast solvers		
2019-2020	Silvia Preda	Tesi magistrale in matematica	Università di Pavia
	Modellizzazione di flussi idrici sotterranei		
	(Silvia is now a PhD candidate at Insubria University)		
2017-2018	Ivar Stangeby	Master in mathematics	University of Oslo
	Simplex Splines on the Powell–Sabin 12-split		

Computer skills

operative systems	UNIX like, MacOS, exotic, Windows
markup languages	LaTeX, TeX, HTML, CSS
programming languages	matlab, C, C++, D, haskell, mathematica

Software libraries

geoPDEs	former developer and designer	matlab toolbox for IGA
G+SMO	former developer and designer	C++ IGA library
IgASF	author	C++ IGA assembling library

Language skills

Italian	native language
English	studied at school and practiced daily
French	studied at school
Spanish	studied during the Erasmus period in Salamanca
German	few words
Norwegian	few words