

CURRICULUM VITAE

LUCA FORMAGGIA

Last update: November 15, 2025

OFFICE ADDRESS

Dipartimento di Matematica
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EDUCATION

- 09/78–04/84 Undergraduate Studies in Mechanical Engineering at Università degli Studi di Padova (Italy)
- 10/85–10/86 Master of Science in *Finite Element Methods in Engineering Analysis and Design*, Institute for Numerical Methods in Engineering, University College of Swansea (UK).
- 01/87, 02/89 Ph.D., Institute for Numerical Methods in Engineering, University College of Swansea (UK). Thesis title: *A finite element algorithm for modelling of compressible flows.*

PROFESSIONAL CAREER

- 03/89–09/94 Senior researcher at the Computational Aeronautics office of Alenia Aeronautica SpA, Turin, Italy
- 09/94–04/98 Senior researcher in the Applied Mathematics unit of CRS4 (Centro di Ricerca, Sviluppo e Studi Superiori in Sardegna), Cagliari, Italy
- 05/98–08/02 First Assistant of the Chair of Numerical Modelling and Scientific Computing of the Institute of Mathematics of the Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland
- 09/02–01/06 Associate Professor of Numerical Analysis at Politecnico di Milano, Italy
- 02/06–today Professor of Numerical Analysis at Politecnico di Milano, Italy

BIBLIOMETRIC DATA

	SCOPUS	SCHOLAR	MATHSCINET
N. of publications:	139	NA	93
N. of citations:	5202	10662	1901
h-index:	35	44	NA

RESEARCH INTERESTS

- *Numerical Analysis of Partial Differential Equations*: Discretization techniques for multi-physics and multi-scale problems. Differential problems with interfaces. Reduced and hybrid-dimensional models. Mesh generation and adaptation. Anisotropic error estimates. Applications to industrial problems.
 - *Computational Geology and Geophysics*. Numerical modeling of sedimentary basins. Flow and mechanics in fractured porous media. Numerical modelling of landslides.
 - *Mathematical modeling and simulation of the cardiovascular system*. Multiscale models. Coupled problems. Fluid-structure interaction problems.
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MAIN INSTITUTIONAL AND SCIENTIFIC RESPONSIBILITIES AT POLITECNICO DI MILANO

2023-today	Scientific Coordinator of the research line "Mathematics for sustainability" of the "Department of Excellence 2023-27" project of the Department of Mathematics, Politecnico di Milano; Member of the Managing Board (Giunta) of the Department of Mathematics of Politecnico di Milano. 2013-16, 2017-19, 2023-today; Member of the Scientific Committee of the Department of Mathematics of Politecnico di Milano. 2014-17, 2023-today;
2018-today	Member of the Managing Board of the Cooperation Agreement between Politecnico di Milano and Eni S.p.A. The board, formed by Politecnico di Milano and ENI members, oversees the research activities between the institutions;
2006-today	Member of the Academic Board (Collegio di Dottorato) of the PhD Program "Mathematical Models and Methods in Engineering" (formerly "Ingegneria Matematica") of Politecnico di Milano;
2018-today	Responsible of Workpackage n.5 "Mathematical models and simulations" of the agreement between the Italian Space Agency and Politecnico di Milano n. 2018-5-HH.0;
2017-today	Academic Advisor of the SIAM Student Chapter of Politecnico di Milano;
2022-24	Member of the Scientific Board of Poliedra, a consortium of Politecnico di Milano;
2014-17	Head of the MOX Laboratory of the Department of Mathematics of Politecnico di Milano;
2012-22	Scientific supervisor of the research agreement between the Department of Mathematics of Politecnico di Milano and Altran S.p.A.;

2013-2015	Scientific supervisor of the research agreement between the Department of Mathematics of Politecnico di Milano and MOXOFF S.r.l.;
2009-2015	Scientific supervisor of the research agreement between the Department of Mathematics of Politecnico di Milano and ENI Spa.

MAIN SERVICE ACTIVITIES

2023-today	Member of the Italian commission for academic habilitation (ASN) for the scientific sector of Numerical Analysis;
2025-today	Vice-president of the Activity Group on Geosciences of the Society for Industrial and Applied Mathematics (SIAM);
2017-25	President of SIMAI (Italian Society of Industrial and Applied Mathematics);
2023-24	Program Director of the Activity Group on Geosciences of the Society for Industrial and Applied Mathematics (SIAM);
2021-today	Member of the scientific evaluation panel for the Chilean Milenio Science Initiative;
2021	Member of the panel of experts nominated by the Italian Ministry of Research (MUR) to elaborate the Italian National Research Plan (PNR) for the years 2021-2027, for the sector “Digitalization, Industry and Aerospace”;
2022	Member of the group of experts chosen by the Italian University Council (CUN) to elaborate the mission and scope (“declaratoria”) of the Italian scientific sector of Numerical Analysis;
2017-22	Member of the Scientific Committee of AMIES (Agence pour les mathématiques en interaction avec l’entreprise et la société);
2017-18	Member of the Italian commission for academic habilitation (ASN) for the scientific sector of Numerical Analysis;
2009-17	Secretary of SIMAI (Italian Society of Industrial and Applied Mathematics).

SPINOFF ACTIVITIES

2010-today	Founder and member of the Board of Directors and of the Scientific Committee of MOXOFF (www.moxoff.com), a spinoff of Politecnico di Milano.
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PARTICIPATION/COORDINATION OF RESEARCH PROJECT (LAST 10 YEARS)

Supported by National or European research financing bodies.

2024-today	Participation to the project “dealii-X: an Exascale Framework for Digital Twins of the Human Body”, EU Program HORIZON.2.4 - Digital, Industry and Space.
2023-today	Member of the Spoke 6 “Multiscscale Modelling and Engineering Applications” of the National Center on HPC, Big Data and Quantum Computing, financed by the Italian Ministry of Research under the PNRR European Project “Next Generation EU”.

2018-today	Responsible of Work Package n.5: Data analysis and mathematical tools for environmental risk assessment of the "Accordo Quadro ASI-Polimi per attività di ricerca e innovazione" (P.I. Prof. Giuseppe Sala).
2014-17	Coordination (P.I.) of MIUR PRIN12. <i>Mathematical and numerical modelling of the cardiovascular system and clinical applications.</i>
2022-23	Scientific Advisor of MSCA Grant n.101031434. — Deep Learning Enhanced Numerical Simulations of Mixed-dimensional Models for Subsurface Flows — MiDiROM - H2020 MSCA-IF-2020
2017-18	Principal Investigator of INdAM-GNCS project "Modellazione numerica di fenomeni idro/geomeccanici per la simulazione di eventi sismici".
2016	Coordinator of the IHP Trimester on Numerical Methods for PDEs, Institute Henry Poincaré, Paris, France, 5 September-16 Dicembre 2016. With D. di Pietro and A. Ern. Financed by Institute Henry Poincaré and CNRS France.
Financed by Industries or Private Bodies (with coordinating role).	
2025-today	Scientific coordinator for DMAT of the project "TWINFALL- digital TWIN for rock FALL and flow in response to a climate change scenario", financed by Fondazione Cariplo. Principal Investigator: Laura Longoni, DICA.
2024-today	Scientific coordinator for DMAT of the project "Sviluppo di modelli e algoritmi per il monitoraggio satellitare delle infrastrutture di distribuzione", financed by SNAM SpA. Principal Investigator: Laura Longoni, DICA.
2021-24	Scientific Coordinator of GEOCHRON, a research contract between Politecnico di Milano and Eni SpA on the development of numerical tools for geological restoration.
2014-15	Scientific Coordinator , with S. Micheletti, of the project GEOMECH on fault reactivation and induced seismicity. Financed by Eni spa.
2013-2015	Scientific Coordinator of the project KAFRES upscaling on the development of upscaling techniques for fractured reservoirs. Financed by Eni spa.

MAIN CONFERENCE ORGANIZATION (LAST 10 YEARS)

- Member of the Scientific Committee of SimRace, Conference on numerical methods and High Performance Computing for industrial fluid flows, Rueil-Malmaison (France), 8-10 December 2015
- Member of the Scientific Committee of the Ecomas Conference X-DMS on Extended Discretization Methods, Ferrara (Italy), 9-11 September 2015
- Head of the Organizing Committee of the SIMAI 2016 Biannual Congress, Milano (Italy), 13-16 September 2016
- Member of the Scientific Committee of the Ecomas X-DMS 2017 Conference on Extended Discretization Methods, Umea (Sweden), 19-21 June 2017
- Member of the Scientific Committee of the SIAM Conference on Imaging Science. Bologna, Italy, June 5-8 2018
- Member of the Scientific Committee of the SIMAI 2018 Biannual Congress, Rome, 2-6 July, 2018

- Member of the International Advisory Committee of the 6th Int. Conf. Computational and Mathematical Biomedical Engineering (CMBE19), Tohoku University, Katahira Campus, Sendai City, Japan, 10-12 June 2019
- Member of the Scientific Committee of the Ecomas X-DMS 2019 Conference of Extended Discretization Methods for Partial Differential Equations on Complex and Evolving Domains, Lugano (Switzerland), 3-5 July 2019
- Member of the Scientific Committee of NUMTA 2019, The 3rd International Conference and summer school on Numerical Computation: Theory and Algorithms. June 15-21, 2019, Le Castella Village, Italy
- Member of the Scientific Committee of the Workshop on Mathematical Modelling and Control for Healthcare and Biomedical Systems, Rome, Italy, September 8-10, 2020
- Member of the Scientific Committee of SIMAI2020+21, Congress of the Italian Society for Applied and Industrial Mathematics, 15-19 June 2021, Parma, Italy
- Member of the International Advisory Committee of the 7th International Conference on Computational and Mathematical Methods in Biomedical Engineering (CMBE21), 28-30 June 2021, Politecnico di Milano, Italy
- co-Chair of SIAM-GS21, SIAM Conference on Mathematical and Computational Issues in the Geosciences, 21-24 June 2021 (online), Politecnico di Milano, Italy
- Member of the Scientific Committee of SIMAI Biennial Congress 2023, 28th August- 3rd September 2023, Matera, Italy.
- Member of the Scientific Committee of HPCSIM24: Frontiers of High-Performance Computing in Modeling and Simulation, July 4-5, Milano, Italy
- Member of the Scientific Committee of ECCOMASS2024, 3rd-7th June 2024, Lisbon, Portugal
- Member of the Scientific Committee of SIMAI Biennial Congress 2025, September 1-5, 2025, Trieste, Italy
- co-Chair of the SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS25), October 14-17, 2025, Baton Rouge, Louisiana, US.
- Member of the Scientific Committee and coordinator of the Numerical Analysis Section of the Equadiff Conference 2026, Prague, Czech Republic

EDITORIAL ACTIVITIES

2022-today	Member of the Editorial Board of Computational Geosciences.
2012-today	Chief Editor of the SEMA-SIMAI Springer Series, a series that focus on applications of mathematics to social and industrial problems, including biology, medicine, engineering, environment and finance.
2017-today	Member of the Editorial Board of Communications in Applied and Industrial Mathematics
2011-2017	Member of the Editorial Board of the SIAM Journal of Scientific Computing (SISC)
2010-2020	Member of the Editorial Board of the International Journal for Numerical Methods in Biomedical Engineering

INVITED TALKS AT INTERNATIONAL CONFERENCES

1. *Implementation of a 3D explicit Euler solver on a Cray computer.* **Keynote Lecture**, Fourth International Symposium on Science and Engineering on Cray Supercomputers, 12-14 October 1988, Minneapolis Minnesota.
2. *Mesh generation and adaption strategies for Euler and Navier-Stokes equations.* **Keynote Lecture**. Workshop on Grid Adaptation in Computational PDE's: Theory and Applications, Edimbrough, July 1996.
3. *Some anisotropic mesh adaption strategies for the FEM.* **Keynote Lecture**. Chemnitz-FEM Symposium 2002, Chemnitz, Germania, 23-25 September 2002.
4. *Multiscale modelling of the cardiovascular system.* **Keynote Lecture**. Second International Symposium on Modelling of Physiological Flows, 31st March-2nd April 2005, Sesimbra, Portugal.
5. *Fluid-structure interaction problems in free surface flows: application to boat dynamics.* **Keynote Lecture**. ICFD06, Conference on Numerical Methods for Fluid Dynamics, University of Reading, 26-29 March 2007
6. *Numerical models for the evolution of geological basins and oil generation.* **Plenary Lecture** for the SIMAI 2010 conference, Cagliari, Italy, June 22nd 2010
7. *Numerical models for the simulation of the cardiovascular system,* **Plenary Lecture** at the INI/WIMCS meeting on Computational challenges in PDEs, Swansea, UK, April 4-8, 2011.
8. *The challenge of complexity in sedimentary and reservoir simulations,* **Keynote Lecture**, ACME-UK 2015. 23rd Conference on Computational Mechanics, 8-10 April 2015, Swansea, UK.
9. *Some numerical challenges of numerical simulations of subsurface flows,* **Plenary Lecture** at the first joint Brazil-Italy meeting in Mathematics, Rio de Janeiro, 29 August, 2nd September 2016
10. *Geometrical multiscale modeling of liquid packaging systems: an example of scientific cross-fertilization,* **Plenary Lecture** at the ECMI 2016 Conference. 13-17th June 2016. Santiago de Compostela, Spain.
11. *Darcy flow in fractured porous media: some mathematical and numerical aspects,* **Invited Lecture** at the Gordon Research Conference on Flow and Transport in Porous Media, July 31-August 5, 2016
12. *Some numerical techniques for problems with embedded domeins and interfaces,* **Plenary Lecture** at the XDMS 2017 conference on eXtended Discretization MethodS for partial differential equations on complex and evolving domains. 19-21 June 2017, Umea, Sweden.
13. *Approximation of fractured porous media flow by mimetic finite differences,* **Invited Lecture** at POEMS 2017, Polytopal Element Methods in Mathematics and Engineering, 5-7 July 2017, University of Milano-Bicocca, Italy.
14. *Numerical model for fault reactivation based on a Nitsche method and XFEM,* **Invited Lecture** at the Oberwolfach Workshop on Reactive flow in deformable, complex media. 31st August 2018.

15. *Numerical modeling of flow in fractured porous media and fault reactivation*, **Plenary Lecture** at NUMTA2019, 3rd International Conference and Summer School on Numerical Computations: Theory and Algorithms, Capo Rizzuto, Italy, 2019.
16. *Numerical techniques for fluid-structure interaction problems with large displacements and applications in hemodynamics*, **Keynote Lecture** at the 3rd International Conference on Modern Mathematical Methods and High Performance Computing in Science & Technology, Inderprastha Engineering College, Ghaziabad, Uttar Pardesh, India, 2019.
17. *Hybrid-dimensional models for porous media flows some algorithms and preconditioning techniques* **Invited talk** at the Algorithmy 2020 Conference on Scientific Computing, September 10-15, 2020.
18. *Block preconditioners for Darcy problems in fractured media*, **Invited Talk** at INdAM Workshop on Polygonal methods for PDEs:theory and applications, online, May 17-19, 2021
19. *Some modeling and numerical issues for modeling underground flows*, **Invited Talk** at Frame 2022, Turin, Italy,2022
20. *Some reactive models for reactive flow in fractured porous media*, **Invited Talk** at Poems22, Politecnico di Milano, Italy, 12-14 December 2022.
21. *La matematica per l'innovazione digitale nei processi industriali*, **Invited Talk** at the 38th CAE Conference, Venice, Italy, 2022
22. *Simulation of Reactive Flow in Fractured Porous Media with Hybrid Dimensional Models and Polytopal Grids*, **Invited Talk** at the 14th international conference on large-scale scientific computations, Sozopol, Bulgaria, 2023
23. *Scalable adaptive techniques for simulation of fast landslides*, **Invited Talk** at HPCSIM: frontiers of high-performance computing in modeling and simulation, Padova, Italy, 2023.
24. *Some applications of model order reduction techniques to subsurface flows*. **Invited Talk** at the Workshop on Mathematical Models and Numerical Methods for Multiphysics Systems, Pittsburgh, May 1-3, 2024 ,
25. *A depth-averaged material point method for fast flow-like landslides and mudflows*, **Invited Talk** at the 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics, Vancouver, July 21-26, 2024
26. *Reduced order models for mixed dimensional fluid flow: combining stable finite volume methods with machine learning*. **Invited Talk** at the Workshop "Mathematical Challenges in Brain Mechanics", Oslo, 21st August 2025
27. *Landslide simulations by depth averaged numerical methods: mesh based and material particle models*.**Invited Talk** at the LSSC25 Conference, Sozopol, 16th June 2025.

MAIN TEACHING ACTIVITY

Politecnico di Milano

<i>A. Y(s).</i>	<i>Course Title</i>

2002-03,03-04, 04-05, 06-07, 07-08	Calcolo Numerico, B.Sc Aeronautical Engineering
2003-04	Calcolo Numerico, B.Sc Mechanical Engineering
2004-05, 06-07	Metodi Analitici e Numerici per l'Ingegneria. BSc Mechanical Engineering
2005-06, 06-07, 07-08, 08-09, 09-10, 10-11, 11-12, 12-13, 13-14	Programmazione Avanzata per il Calcolo Scientifico, MSc Mathematical Engineering
2007-08, 08-09, 09-10, 10-11, 11-12, 12-13, 13-14	Modellistica Numerical per Problemi Differenziali, MSc Aerospace Engineering
2014-15,16-17,17-18, 19-20, 20-21, 21-22, 22-23, 23-24, 24-25 25-26	Advanced Programming for Scientific Computing. MSc Mathematical Engineering
2014-15, 16-17	Numerical Modelling of Differential Problems, MSc Aerospace Engineering
2017-18,18-19,19-20,20-21, 21-22	Calcolo Numerico. BSc Environmental Engineering
2022-23, 23-24, 24-25 25-26	Advanced Methods for Scientific Computing, MSc on High Performance Computing

EPFL

<i>A. Y(s).</i>	<i>Course Title</i>
1998-99, 99-2000	Exercise session of the course <i>Analyse Numerique</i> for engineering students
1998-99, 99-2000, 2000-0, 01-02	Course on <i>Scientific Computing</i> at the "Master Course on Mathematical Engineering, EPFL e École Polytechnique de Paris.
1999-2000	Exercise session of the course <i>Mathematical Modelling</i> for students of engineering and physics
2000-01	Exercise sessions for the course <i>Mathematical Modelling of the Cardiovascular System</i> for students of Mathematics
2000-01, 01-02	Numerical Analysis for Civil Engineers and Physics, EPFL and University of Lausanne

SUPERVISION ACTIVITY

Supervision of PhD Thesis

1. A. Bulgalho de Moura, *The Geometrical multiscale modelling of the cardiovascular system: coupling 3D FSI and 1D models*, Mathematical Engineering, Politecnico di Milano, Italy, 2008
2. Sara Minisini, *Mathematical and numerical modeling of drug eluting stents*, Mathematical Engineering, Politecnico di Milano, Italy, 2009
3. Andrea Mola, *A model for the dynamics of high performance rowing boats*.Mathematical Engineering, Politecnico di Milano, Italy, 2009
4. Andrea Villa, *Three dimensional geophysical modeling: from physics to numerical simulation*, Applied Mathematics, Università degli studi di Milano, Italy, 2009

5. Anna Scotti, *Models for oil generation and primary migration*, Mathematical Engineering, Politecnico di Milano, Italy, 2009
6. Alessio Fumagalli, *Numerical modelling of flows in fractured media by the XFEM method*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2012
7. Matteo Pischiutta, *Mathematical and numerical modelling of the evolution of mixtures of sand in aeolian dunes*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2012
8. Nur Fadel, *HPC simulation of sedimentary basins*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2013
9. Alessandro Melani, *Adjoint-based parameter estimation in human vascular one dimensional models*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2013
10. Davide Baroli, *Multiscale models for heterogeneous Darcy's flows*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2015.
11. Stefano Zonca, *Unfitted numerical methods for fluid-structure interaction arising between an incompressible fluid and an immersed thick structure* Mathematical Models and Methods in Engineering, Politecnico di Milano, 2018.
12. Bianca Giovanardi, *Numerical modeling of hydro-mechanical coupling in deformable porous media: compaction and fractures*. Mathematical Models and Methods in Engineering, Politecnico di Milano, 2018.
13. Daquin Liu, *A numerical method for analyzing fault slip tendency under fluid injection with XFEM*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2018.
14. Florent Chave, *Hybrid High-Order methods for interface problems* in co-sharing with Prof. Di Pietro of University of Montpellier, France. PhD grantee of a Vinci France Italy Scholarship, 2018.
15. Ludovica Del Popolo Carciopolo. *Conservative multirate schemes for flow in heterogeneous porous media*. Mathematical Models and Methods in Engineering, Politecnico di Milano, 2020.
16. Federico Gatti. *Effective Numerical Modelling of Hillslope Processes: Sediment Transport and Landslide Runout*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2023.
17. Enrico Ballini. *Flow and mechanics in fractured porous media: from high fidelity models to efficient reduced order solutions*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2024.
18. Marco Fois. *Particle Based Numerical Methods for Landslides: Run-out and Impact Analysis*, Mathematical Models and Methods in Engineering, Politecnico di Milano, 2024.
19. Simone Brivio. Mathematical Models and Methods in Engineering, Politecnico di Milano, ongoing.
20. Marco Scarpelli, Mathematical Models and Methods in Engineering, Politecnico di Milano, ongoing.
21. Marco Botta, Mathematical Models and Methods in Engineering, Politecnico di Milano, ongoing.

Supervision of Master Thesis

Supervisor of more than 50 Master thesis in Mathematical Engineering, Aeronautical Engineering and High Performance Computing Engineering at Politecnico di Milano.

MAIN PUBLICATIONS

ARTICLES ON REFEREED JOURNALS

- [1] Federico Gatti, Carlo de Falco, Marco Fois, and Luca Formaggia. A scalable well-balanced taylor-galerkin scheme for a lava flow depth-integrated model with point source vents. *Computers & Mathematics with Applications*, 184:153–167, April 2025.
- [2] Marco Fois, Federico Gatti, Carlo de Falco, and Luca Formaggia. A comparative analysis of mesh-based and particle-based numerical methods for landslide run-out simulations. *Computers & Fluids*, 295:106641, June 2025.
- [3] A. Catenacci, M. Pesenti, E. Paini, G. Rizzardi, L. Formaggia, R. Canziani, and A. Turolla. Practical application and calibration of apparent half-saturation coefficients for aerobic granular sludge modelling: Limitations and value. *Journal of Water Process Engineering*, 71:107292, March 2025.
- [4] Alessandro Palumbo, Eleonora Arnone, Luca Formaggia, and Laura M. Sangalli. Functional principal component analysis for incomplete space–time data. *Environmental and Ecological Statistics*, 31(2):555–582, March 2024.
- [5] Alessandro Palumbo, Eleonora Arnone, Luca Formaggia, and Laura M. Sangalli. Functional principal component analysis for incomplete space–time data. *Environ. Ecol. Stat.*, 31(2):555–582, March 2024.
- [6] Federico Gatti, Carlo de Falco, Simona Perotto, Luca Formaggia, and Manuel Pastor. A scalable well-balanced numerical scheme for the modeling of two-phase shallow granular landslide consolidation. *J. Comput. Phys.*, 501:112798, March 2024.
- [7] Federico Gatti, Carlo de Falco, Simona Perotto, and Luca Formaggia. A scalable well-balanced numerical scheme for the simulation of fast landslides with efficient time stepping. *Appl. Math. Comput.*, 468:128525, May 2024.
- [8] Marco Fois, Carlo de Falco, and Luca Formaggia. A semi-conservative depth-averaged material point method for fast flow-like landslides and mudflows. *Commun. Nonlinear Sci.*, 138:108202, November 2024.
- [9] Enrico Ballini, Luca Formaggia, Alessio Fumagalli, Anna Scotti, and Paolo Zunino. Application of deep learning reduced-order modeling for single-phase flow in faulted porous media. *Computational Geosciences*, 28(6):1279–1303, August 2024.
- [10] Enrico Ballini, Luca Formaggia, Alessio Fumagalli, Eirik Keilegavlen, and Anna Scotti. A hybrid upwind scheme for two-phase flow in fractured porous media. *Computer Methods in Applied Mechanics and Engineering*, 432:117437, December 2024.
- [11] Federico Gatti, Marco Fois, Carlo de Falco, Simona Perotto, and Luca Formaggia. Parallel simulations for fast-moving landslides: Space-time mesh adaptation and sharp tracking of the wetting front. *Int. J. Numer. Meth. Fl.*, 95(8):1286–1309, March 2023.
- [12] Alessio Fumagalli, Lorenzo Panzeri, Luca Formaggia, Anna Scotti, and Diego Arosio. A mixed-dimensional model for direct current simulations in the presence of a thin high-resistivity liner. *Int. J. Numer. Meth. Eng.*, 125(6), December 2023.
- [13] Samuel Burbulla, Luca Formaggia, Christian Rohde, and Anna Scotti. Modeling fracture propagation in poro-elastic media combining phase-field and discrete fracture models. *Comput. Method. Appl. M.*, 403:115699, January 2023.

- [14] Eleonora Arnone, Carlo De Falco, Luca Formaggia, Giorgio Meretti, and Laura M. Sangalli. Computationally efficient techniques for spatial regression with differential regularization. *Int. J. Comput. Math.*, 100(10):1971–1991, August 2023.
- [15] Luca Formaggia, Paola Gervasio, Yvon Maday, and Hoang Xuan Phu. Mathematical modelling and scientific computing: an effective way to understand reality. *Vietnam J. Math.*, 50(4):829–832, October 2022. Preface to two special issues dedicated to Alfio Quarteroni on the occasion of his 70th birthday.
- [16] Luca Formaggia, Federico Gatti, and Stefano Zonca. An XFEM/DG approach for fluid-structure interaction problems with contact. *Applications of Mathematics*, 66(66):183–211, 2021.
- [17] L. Formaggia, A. Fumagalli, and A. Scotti. A multi-layer reactive transport model for fractured porous media. *Math. Eng.*, 4(1):1–32, 2021.
- [18] Mara S. Bernardi, Pasquale C. Africa, Carlo De Falco, Luca Formaggia, Alessandra Menafoglio, and Simone Vantini. On the use of interferometric synthetic aperture radar data for monitoring and forecasting natural hazards. *Math. Geosci.*, 53:1781–1812, 2021.
- [19] Paola F. Antonietti, Jacopo De Ponti, Luca Formaggia, and Anna Scotti. Preconditioning techniques for the numerical solution of flow in fractured porous media. *J. Sci. Comput.*, 86(1):1–32, 2021.
- [20] D. Cerroni, L. Formaggia, and A. Scotti. A control problem approach to Coulomb’s friction. *J. Comput. Appl. Math.*, 385:113196, 2020.
- [21] Ludovica Delpopolo Carciopolo, Luca Formaggia, Anna Scotti, and Hadi Hajibeygi. Conservative multirate multiscale simulation of multiphase flow in heterogeneous porous media. *J. Comput. Phys.*, 404(109134), March 2020.
- [22] Ludovica Delpopolo Carciopolo, Matteo Cusini, Luca Formaggia, and Hadi Hajibeygi. Adaptive multilevel space-time-stepping scheme for transport in heterogeneous porous media (ADM-LTS). *J. Comput. Phys. X*, 6:100052, 2020.
- [23] F. Chave, D. A. Di Pietro, and L. Formaggia. A Hybrid High-Order method for passive transport in fractured porous media. *GEM - International Journal on Geomathematics*, 10(12):1–12, 2019.
- [24] S. Zonca, C. Vergara, and L. Formaggia. An unfitted formulation for the interaction of an incompressible fluid with a thick structure via an XFEM/DG approach. *SIAM J. Sci. Comput.*, 40(1):59–84, 2018.
- [25] Mikel Landajuela, Christian Vergara, Antonello Gerbi, Luca Dedé, Luca Formaggia, and Alfio Quarteroni. Numerical approximation of the electromechanical coupling in the left ventricle with inclusion of the Purkinje network. *Int. J. Numer. Meth. Bio.*, 34(7):1–24, 2018.
- [26] Luca Formaggia, Christian Vergara, and Stefano Zonca. Unfitted extended finite elements for composite grids. *Computers and Mathematics with Applications*, 76(4):893–904, 2018.
- [27] L. Formaggia, A. Scotti, and F. Sottocasa. Analysis of a mimetic finite difference approximation of flows in fractured porous media. *ESAIM Math. Model. Numer. Anal.*, 52(2):595–630, 2018.
- [28] Florent Chave, Daniele A. Di Pietro, and Luca Formaggia. A Hybrid High-Order method for Darcy flows in fractured porous media. *SIAM J. Sci. Comput.*, 40(2):A1063–A1094, 2018.
- [29] Ludovica Delpopolo Carciopolo, Luca Bonaventura, Anna Scotti, and Luca Formaggia. A conservative implicit multirate method for hyperbolic problems. *Computat. Geosci.*, 23(4):647–664, 2018.

- [30] Christian Vergara, Davide Le Van, Maurizio Quadrio, Luca Formaggia, and Maurizio Domanin. Large eddy simulations of blood dynamics in abdominal aortic aneurysms. *Med. Eng. Phys.*, 47:38–46, 2017.
- [31] Bianca Giovanardi, Anna Scotti, and Luca Formaggia. A hybrid XFEM–Phase field (Xfield) method for crack propagation in brittle elastic materials. *Comput. Method. Appl. M.*, 320:396–420, 2017.
- [32] Alessio Fumagalli, Stefano Zonca, and Luca Formaggia. Advances in computation of local problems for a flow-based upscaling in fractured reservoirs. *Math. Comput. Simulat.*, 137:299–324, 2017.
- [33] P. Zunino, J. Tambaca, E. Cutrì, S. Canic, L. Formaggia, and F. Migliavacca. Integrated stent models based on dimension reduction: review and future perspectives. *Ann. Biomed. Eng.*, 44(2):604–617, 2016.
- [34] Alberto Ferroni, Luca Formaggia, and Alessio Fumagalli. Numerical analysis of Darcy problems on surfaces. *ESAIM Math. Model. Numer. Anal.*, 50(6):1615–1630, 2016.
- [35] Franco Dassi, Luca Formaggia, and Stefano Zonca. Degenerate tetrahedra removal. *Appl. Numer. Math.*, 110:1–13, 2016.
- [36] Paola F. Antonietti, Luca Formaggia, Anna Scotti, Marco Verani, and Nicola Verzotti. Mimetic finite difference approximation of flows in fractured porous media. *ESAIM Math. Model. Numer. Anal.*, 50(3):809–832, 2016.
- [37] A. Agosti, B. Giovanardi, L. Formaggia, and A. Scotti. A numerical procedure for geochemical compaction in the presence of discontinuous reactions. *Adv. Water Resour.*, 94:332–344, 2016.
- [38] Nicola Giuliani, Andrea Mola, Luca Heltai, and Luca Formaggia. FEM SUPG stabilisation of mixed isoparametric BEMs: application to linearised free surface flows. *Eng. Anal. Boundary Elem.*, 59:8–22, 2015.
- [39] Bianca Giovanardi, Anna Scotti, Luca Formaggia, and Paolo Ruffo. A general framework for the simulation of geochemical compaction. *Computat. Geosci.*, 19(5):1027–1046, 2015.
- [40] Franco Dassi, Simona Perotto, and Luca Formaggia. A priori anisotropic mesh adaptation on implicitly defined surfaces. *SIAM J. Sci. Comput.*, 37(6):A2758–A2782, 2015.
- [41] D. Bonomi, C. Vergara, E. Faggiano, M. Stevanella, C. Conti, A. Redaelli, G. Puppini, G. Faggian, L. Formaggia, and G. B. Luciani. Influence of the aortic valve leaflets on the fluid-dynamics in aorta in presence of a normally functioning bicuspid valve. *Biomech. Model. Mechanobiol.*, 14(6):1349–1361, 2015.
- [42] A. Agosti, L. Formaggia, and A. Scotti. Analysis of a model for precipitation and dissolution coupled with a Darcy flux. *J. Math. Anal. Appl.*, 431(2):752–781, July 2015.
- [43] Stefano Morlacchi, Claudio Chiastra, Elena Cutrì, Paolo Zunino, Francesco Burzotta, Luca Formaggia, Gabriele Dubini, and Francesco Migliavacca. Stent deformation, physical stress, and drug elution obtained with provisional stenting, conventional culotte and tryton-based culotte to treat bifurcations: a virtual simulation study. *EuroIntervention*, 9(12):1441–1453, 2014.
- [44] L. Formaggia, A. Fumagalli, A. Scotti, and P. Ruffo. A reduced model for Darcy’s problem in networks of fractures. *ESAIM Math. Model. Numer. Anal.*, 48(4):1089–1116, 2014.
- [45] F. Dassi, S. Perotto, L. Formaggia, and P. Ruffo. Efficient geometric reconstruction of complex geological structures. *Mathematics and Computers in Simulations*, 106:163–184, 2014.

- [46] L. Cattaneo, L. Formaggia, G. F. Iori, A. Scotti, and P. Zunino. Stabilized extended finite elements for the approximation of saddle point problems with unfitted interfaces. *Calcolo*, 52(2):123–152, February 2014.
- [47] Elena Cutrì, Luca Formaggia, Paolo Zunino, Stefano Morlacchi, Claudio Chiastra, and Francesco Migliavacca. Drug delivery patterns for different stenting techniques in coronary bifurcations: a comparative computational study. *Biomechanics and modeling in mechanobiology*, 12(4):657–669, 2013.
- [48] L. Tamellini, L. Formaggia, E. Miglio, and A. Scotti. An Uzawa iterative scheme for the simulation of floating bodies. *Computers and Fluids*, 68:148–158, 2012.
- [49] L. Formaggia and C. Vergara. Prescription of general defective boundary conditions in fluid-dynamics. *Milan J. Math.*, 80(2):333–350, 2012.
- [50] L. Formaggia, A. Quarteroni, and C. Vergara. On the physical consistency between three-dimensional and one-dimensional models in haemodynamics. *J. Comput. Phys.*, 244:97–112, 2012.
- [51] L. Formaggia, A. Guadagnini, I. Imperiali, V. Lever, G. M. Porta, M. Riva, A. Scotti, and L. Tamellini. Global sensitivity analysis through polynomial chaos expansion of a basin-scale geochemical compaction model. *Computat. Geosci.*, 17(1):25–42, 2012.
- [52] A. Casagrande, P. Leyland, and L. Formaggia. Parallel mesh adaptive techniques for complex flow simulation: geometry conservation. *Modelling and Simulation in Engineering*, 43:1–13, 2012.
- [53] J. Alastruey, T. Passerini, L. Formaggia, and J. Peiró. Physical determinants of the arterial pulse waveform: theoretical analysis and estimation using the 1-D formulation. *J. Eng. Math.*, 77(1):1–19, 2012.
- [54] M. Pischiutta, L. Formaggia, and F. Nobile. Mathematical modelling for the evolution of aeolian dunes formed by a mixture of sands: entrainment-deposition formulation. *Commun. Appl. Ind. Math.*, 2(2):1–21, 2011.
- [55] L. Formaggia and A. Scotti. Positivity and conservation properties of some integration schemes for mass action kinetics. *SIAM J. Numer. Anal.*, 49:1267–1288, 2011.
- [56] L. Formaggia and A. Villa. Implicit tracking for multi-fluid simulations. *J. Comput. Phys.*, 229:5788–5802, 2010.
- [57] L. Formaggia, A. Veneziani, and C. Vergara. Flow rate boundary problems for an incompressible fluid in deformable domains: formulations and solution methods. *Comput. Method. Appl. M.*, 199(9-12):677–688, 2010.
- [58] L. Formaggia, S. Minisini, and P. Zunino. Stent a rilascio di farmaco: una storia di successo per la matematica applicata. *La Matematica nella Società e nella Cultura (Rivista della Unione Matematica Italiana)*, III:181–200, 2010.
- [59] L. Formaggia, S. Minisini, and P. Zunino. Modeling erosion controlled drug release and transport phenomena in the arterial tissue. *Math. Models Method Appl. Sci.*, 20(10):1759–1786, 2010.
- [60] A. F. Corno, C. Vergara, C. Subramanian, R. A. Johnson, T. Passerini, A. Veneziani, L. Formaggia, N. Alphonso, A. Quarteroni, and J. C. Jarvis. Assisted Fontan procedure: animal and in vitro models and computational fluid dynamics study. *Interactive CardioVascular and Thoracic Surgery*, 10(5):679–684, 2010.

- [61] T. Passerini, M. R. de Luca, L. Formaggia, A. Quarteroni, and A. Veneziani. A 3D/1D geometrical multiscale model of cerebral vasculature. *J. Eng. Math.*, 64(4):319–330, 2009.
- [62] L. Formaggia, E. Miglio, A. Mola, and A. Montano. A model for the dynamics of rowing boats. *Int. J. Numer. Meth. Fl.*, 61(2):119–143, 2009.
- [63] R. Balossino, G. Pennati, F. Migliavacca, L. Formaggia, A. Veneziani, M. Tuveri, and G. Dubini. Computational models to predict stenosis growth in carotid arteries: which is the role of boundary conditions? *Comput Method Biomech Biomed Engin*, 12(1):113–123, 2009.
- [64] L. Formaggia, A. Veneziani, and C. Vergara. A new approach to the numerical solution of defective boundary problems in incompressible fluid dynamics. *SIAM J. Numer. Anal.*, 46(6):2769–2794, 2008.
- [65] L. Formaggia, E. Miglio, A. Mola, and N. Parolini. Fluid-structure interaction problems in free-surface flows: application to boat dynamics. *Int. J. Numer. Meth. Fl.*, 56(8):965–978, 2008.
- [66] J. Peirò, L. Formaggia, M. Gazzola, A. Radaelli, and V. Rigamonti. Shape reconstruction from medical images and quality mesh generation via implicit surfaces. *Int. J. Numer. Methods Fluids*, 53:1339–1360, 2007.
- [67] F. Migliavacca, F. Gervaso, G. Dubini, M. Prosi, P. Zunino, S. Minisini, L. Formaggia, and G. Dubini. Expansion and drug elution model of a coronary stent. *Computer Methods in Biomechanical and Biomedical Engineering.*, 10(1):63–73, 2007.
- [68] L. Formaggia, A. Moura, and F. Nobile. On the stability of the coupling of 3D and 1D fluid-structure interaction models for blood flow simulations. *ESAIM Math. Model. Numer. Anal.*, 41(4):743–769, 2007.
- [69] L. Formaggia, S. Micheletti, R. Sacco, and A. Veneziani. Mathematical modelling and numerical simulation of a glow-plug. *Appl. Numer. Math.*, 57(10):1125–1144, October 2007.
- [70] D. Amadori, S. Ferrari, and L. Formaggia. Derivation and analysis of a fluid-dynamical model in thin and long elastic vessels. *Netw. Heterog. Media*, 2:99–125, 2007.
- [71] G. Selvaggi, S. Anicic, and L. Formaggia. Mathematical explanation of the buckling of the vessels after twisting of the microanastomosis. *Microsurgery*, 26(7):524–528, 2006.
- [72] L. Formaggia, D. Lamponi, A. Veneziani, and M. Tuveri. Numerical modeling of 1D arterial networks coupled with a lumped parameters description of the heart. *Comput. Methods Biomech. Biomed. Engin.*, 9(5):273–288, 2006.
- [73] G. Selvaggi, M. Salgarello, E. Farallo, S. Anicic, and L. Formaggia. Effect of torsion on microvenous anastomotic patency in rat model and early thrombotic phenomenon. *Microsurgery* 24:416-417, 2004. (Letter to editors).
- [74] L. Formaggia and F. Nobile. Stability analysis of second order time accurate schemes for ALE-FEM. *Comput. Method. Appl. M.*, 193:4097–4116, 2004.
- [75] L. Formaggia, S. Micheletti, and S. Perotto. Anisotropic mesh adaption in computational fluid dynamics: application to advection-diffusion-reaction and the Stokes problems. *Appl. Numer. Math.*, 51:511–533, 2004.
- [76] S. J. Sherwin, L. Formaggia, J. Peiró, and V. Franke. Computational modelling of 1D blood flow with variable mechanical properties and its application to the simulation of wave propagation in the human arterial system. *Int. J. Numer. Methods Fluids*, 43(6-7):673–700, 2003.

- [77] B. V. R. Kumar, A. Quarteroni, L. Formaggia, and D. Lamponi. On parallel computation of blood flow in human arterial network based on 1-D modelling. *Computing*, 71(4):321–351, 2003.
- [78] L. Formaggia and S. Perotto. Anisotropic error estimates for elliptic problems. *Numer. Math.*, 94:67–92, 2003.
- [79] L. Formaggia, D. Lamponi, and A. Quarteroni. One dimensional models for blood flow in arteries. *J. Eng. Math.*, 47(3/4):251–276, 2003.
- [80] S. Deparis, M. A. Fernandez, L. Formaggia, and F. Nobile. Modified fixed point algorithm in fluid-structure interaction. *Cr. Mecanique*, 331(8):525–530, 2003.
- [81] S. Deparis, M. A. Fernández, and L. Formaggia. Acceleration of a fixed point algorithm for fluid-structure interaction using transpiration conditions. *ESAIM Math. Model. Numer. Anal.*, 37(4):601–616, 2003.
- [82] L. Formaggia, J.-F. Gerbeau, F. Nobile, and A. Quarteroni. Numerical treatment of defective boundary conditions for the Navier–Stokes equations. *SIAM J. Numer. Anal.*, 40(1):376–401, 2002.
- [83] L. Formaggia, S. Perotto, and P. Zunino. An anisotropic a-posteriori error estimate for a convection-diffusion problem. *Computing and Visualisation in Science*, 4:99–104, 2001.
- [84] L. Formaggia and S. Perotto. New anisotropic a priori estimates. *Numer. Math.*, 89(4):641–667, 2001.
- [85] L. Formaggia, J. F. Gerbeau, F. Nobile, and A. Quarteroni. On the coupling of 3D and 1D Navier-Stokes equations for flow problems in compliant vessels. *Comput. Methods Appl. Mech. Eng.*, 191(6-7):561–582, 2001.
- [86] Cristina Manzi, Francesca Rapetti, and Luca Formaggia. Function approximation on triangular grids: Some numerical results using adaptive techniques. *Appl. Numer. Math.*, 32(4):389–399, 2000.
- [87] L. Formaggia, F. Nobile, A. Quarteroni, and A. Veneziani. Multiscale modelling of the circulatory system: a preliminary analysis. *Comput. Vis. Sci.*, 2(2-3):75–83, 1999.
- [88] L. Formaggia and F. Nobile. A stability analysis for the arbitrary Lagrangian Eulerian formulation with finite elements. *East-West J. Numer. Math.*, 7(2):105–132, 1999.
- [89] G. Abdoulaev, S. Cadeddu, G. Delussu, M. Donizelli, L. Formaggia, A. Giachetti, E. Gobetti, A. Leone, C. Manzi, P. Pili, A. Scheinine, M. Tuveri, A. Varone, A. Veneziani, G. Zanetti, and A. Zorcolo. ViVa: the virtual vascular project. *IEEE Trans. Inf. Technol. Biomed.*, 2(4):268–274, 1998.
- [90] L. Paglieri, D. Ambrosi, L. Formaggia, A. Quarteroni, and A. L. Scheinine. Parallel computation for shallow water flow: A domain decomposition approach. *Parallel Comput.*, 23(9):1261–1277, 1997.
- [91] L. Formaggia, A. Scheinine, and A. Quarteroni. A numerical investigation of Schwarz domain decomposition techniques for elliptic problems on unstructured grids. *Mathematics and Computers in Simulations*, 44:313–330, 1997.
- [92] Vittorio Selmin and Luca Formaggia. Unified construction of finite element and finite volume discretizations for compressible flows. *Int. J. Numer. Methods Eng.*, 39(1):1–32, 1996.
- [93] A. Quarteroni, D. Ambrosi, L. Formaggia, G. Fotia, M. Manzini, M. Mulas, and L. Stolcis. Computational fluid dynamics at CRS4, Italy. *IEEE Computational Science and Engineering*, 3(3):4–8, 1996.

- [94] V. Selmin and L. Formaggia. Simulation of hypersonic flows on unstructured grids. *Int. J. Numer. Methods Eng.*, 34(2):569–606, 1992.
- [95] J. Peraire, J. Peiro, L. Formaggia, K. Morgan, and O. C. Zienkiewicz. Finite element Euler computations in three dimensions. *Int. J. Numer. Methods Eng.*, 26(10):2135–2159, 1988.
- [96] L. Formaggia, J. Peraire, and K. Morgan. Simulation of a store separation using the finite element method. *Appl. Math. Model.*, 12(2):175–181, 1988.

BOOKS AND EDITED BOOKS

- [1] A. Quarteroni, L. Formaggia, and A. Veneziani, editors. *Complex systems in biomedicine*. Springer-Verlag Italia, Milan, 2006.
- [2] S. Perotto and L. Formaggia, editors. *New Challenges in Grid Generation and Adaptivity for Scientific Computing*, volume 5 of *SEMA-SIMAI Springer Series*. Springer, 2015. ISBN 978-3-319-06052-1.
- [3] Alessio Fumagalli, Inga Berre, Luca Formaggia, Eirik Keilegavlen, and Anna Scotti, editors. *Numerical methods for processes in fractured porous media*. Lecture Notes in Geosystems Mathematics and Computing. Springer International, 2019.
- [4] L. Formaggia, F. Saleri, and A. Veneziani. *Solving numerical PDEs: problems, applications, exercises*. UNITEXT. Springer, 2012.
- [5] L. Formaggia, F. Saleri, and A. Veneziani. *Applicazioni ed esercizi di modellistica numerica per problemi differenziali*, volume 17 of *UNITEXT*. Springer Italia, Milan, 2005.
- [6] L. Formaggia, A. Quarteroni, and A. Veneziani, editors. *Cardiovascular Mathematics. Modelling and Simulation of the Circulatory System*, volume 1 of *Modeling, Simulation & Applications*. Springer, 2009.
- [7] Daniele Antonio Di Pietro, Luca Formaggia, and Roland Masson, editors. *Polyhedral Methods in Geosciences*, volume 27 of *SEMA-SIMAI Springer Series*. Springer Nature, 2021.
- [8] D. Di Pietro, A. Ern, and L. Formaggia, editors. *Numerical methods for PDEs: State-of-the-art numerical techniques*, volume 15 of *SEMA-SIMAI Springer Series*. Springer International Publishing, 2018. Book.