# Curriculum vitæ

Daniele A. Di Pietro

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## Contents

# 1 Personal information


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|---|---|---|---|
| **Family name:** | Di Pietro | **Scopus ID:** | 6603444428 |
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| **Birth date:** | 1/1/1979 (age 45) | **ORCID:** | 0000-0003-0959-8830 |
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## 1.1 Education

*6/12/2010* **Habilitation** (*Habilitation à Diriger des Recherches*), École des Ponts (ENPC), Université Paris-Est, *Nonconforming methods for PDEs with diffusion*

*28/3/2006* **PhD Thesis**, Università di Bergamo, *Discontinuous Galerkin methods for the incompressible Navier–Stokes equations*. Part of my PhD thesis was carried out at École Polytechnique Fédérale de Lausanne (EPFL)

*11/7/2002* **Master in Engineering**, Università di Bergamo, 110/110 with honors (lode)

## 1.2 Current positions

*2024–pres.* Corresponding PI of the **ERC SyG NEMESIS**

*2021–pres.* **Director of Institut Montpelliérain Alexander Grothendieck (IMAG)**, Université de Montpellier (UM). IMAG is a joint research unit of University of Montpellier and Centre National de la Recherche Scientifique (CNRS), and one of the hubs of mathematical research in the South of France with over 170 researchers (among which ∼100 faculties). Its former members include the Fields medalist Alexander Grothendieck (who graduated and later served as professor at University of Montpellier). Research at IMAG covers a wide range of topics, from fundamental developments to industrial applications.

*1/9/2012–pres.* **Full professor** (*Professeur des Universités Classe Exceptionnelle*) at IMAG

## 1.3 Previous positions

*2019–2020* **Deputy director of IMAG**

*2014–2020* Head of the *Analyse, Calcul Scientifique Industriel et Optimisation de Montpellier* (ACSIOM) research team (∼40 members, ∼20 of which holding permanent positions). The research activities of ACSIOM focus on the theoretical and numerical analysis of partial differential equations with applications to environmental, biological, and biomedical problems.

*1/4/2007–31/8/2012* **Senior researcher** at the Department of Applied Mathematics of IFP Energies Nouvelles (IFPEN), Rueil-Malmaison (France)

*1/2/2006–31/3/2007* **Post-doctoral researcher** at the Centre d'Enseignement et de Recherche en Mathématiques et Calcul Scientifique (CERMICS), ENPC, Paris (France)

*1/1/2005–30/6/2005* **Visiting PhD assistant**, CMCS, EPFL, Lausanne (Switzerland)

## 1.4 Fellowships, awards, and distinctions

*2023–2024* CNRS professor appointment (*délégation CNRS*, 1 year half time) at IMAG

*2019–2020* CNRS professor appointment (*délégation CNRS*, 1 year half time) at IMAG

*4–5/2018* STaRs invited professor (*Supporting Talented Researchers*) at Università di Bergamo

*2016–2017* CNRS professor appointment (1 year half time) at Institut Henri Poincaré (Paris)
*2016* ITALY (*Italian TALented Young researchers*) fellowship, Università di Bergamo, Italy
*2012–pres.* French national award for Doctoral Supervision and Research

### 1.5 Memberships

*2015–pres.* Member of *Société de Mathématiques Appliquées et Industrielles* (SMAI)
*2016–pres.* Member of *European Mathematical Society* (EMS)
*2015–pres.* Member of the French Research Network MaNu (*Mathématiques pour le Nucléaire*)

## 2 Research activities

### 2.1 Topics

My main research topics include: advanced numerical methods for partial differential equations (PDEs), a priori and a posteriori error analysis, efficient implementation algorithms. I have worked on problems in several branches of fluid- and solid-mechanics, porous media flows, and electromagnetism, mostly issued from applications in the field of energy and environment.

### 2.2 Bibliometrics

As of 15 February 2024, my **104 works in Scopus** have been **cited 2744 times by 1274 documents** and my **h-index is 29**; see https://www.scopus.com/authid/detail.uri?authorId=6603444428. My ten most cited publications in Scopus have 243 / 208 / 175 / 136 / 132 / 121 / 99 / 88 / 79 / 64 citations.

At the same date, my **96 works in MathSciNet** have been **cited 2684 times in 1320 publications**; see http://www.ams.org/mathscinet/search/author.html?mrauthid=790640. My ten most cited publications in MathSciNet have 612 / 196 / 135 / 108 / 107 / 99 / 88 / 77 / 70 / 66 citations.

Finally, according to Google Scholar, at the same date I have collected **5141 citations** (3713 since 2019), corresponding to an **h-index of 38** (31 since 2019) and an **i10-index of 79** (64 since 2019); see https://scholar.google.fr/citations?user=KFd4Jm8AAAAJ&hl=en.

## 3 Scientific outreach

### 3.1 Evaluation of the research

I have acted as referee for all the major international journals in Numerical Analysis and Scientific Computing (*Numer. Math.*, *SIAM J. Numer. Anal.*, *Math. Comp.*, *Math. Models Meth. Appl. Sci.*, *SIAM J. Sci. Comput.*, *J. Comput. Phys.*,*Comp. Math. Appl.*, etc.)

I have also served as referee for several national research agencies and institutions (ANR France, CONACYT Chile, FWF Austrian Science Found, PRIN Italy, The Royal Swedish Academy of Science, NWO Netherlands, Los Alamos National Labs, POR FSE Regione Friuli-Venezia-Giulia, etc.)

I have been member of evaluation panels for ANR and PRIN (Italian Ministery of University and Research) calls. The details omitted owing to the confidentiality agreement.

### 3.2 Editorial activity

*2024–pres.* Editor of Boletín de la Sociedad Matemática Mexicana, Springer and Electronic Research Archive, AIMSPress
*2020–pres.* Associate editor of Numerical Algorithms, Springer
*2020* Editor for the volume *Polyhedral methods in geosciences* of the SEMA-SIMAI Springer series [3]

*2016* Editor for the volume *Numerical methods for PDES: State of the Art Techniques* of the SEMA-SIMAI Springer series [4]

### 3.3 Organization of scientific meetings

*2024* ERC SyG NEMESIS kick-off seminar (Montpellier, France)

*2023* Organizer of the mini-symposium *Recent advancements in Polytopal Methods for Fluid Mechanics* at the CFC2023 conferences (Cannes, France)

*2022* Member of the Scientific Committeee of the POEMS 2022 conference (Milan, Italy). See https://mox.polimi.it/POEMS2022/

*2021* Organizer of the NEMESIS virtual workshop, https://imag.umontpellier.fr/~di-pietro/NEMESIS.html

*2020* Organizer of the mini-symposium *Polyhedral discretization methods for geomechanical simulation*, SIAM Conference on Mathematical & Computational Issues in the Geosciences (GS21), June 21–24, 2021 (Milan, Italy)

*2020* Organizer of the mini-symposium *Low and high-order polytopal methods: developments and applications*, ALGORITHMY 2020 conference (Vysoke Tatry, Podbanske). Conference switched to hybrid mode after the COVID-19 crisis

*2020* Organizer of the mini-symposium *Numerical Methods for Polygonal and Polyhedral Meshes*, WCCM XIV-ECCOMAS 2020 conference (Paris, France). Conference moved to January 2021 in fully virtual mode owing to the COVID-19 crisis

*2019* Organizer of the POEMS 2019 conference at CIRM (29 Apr.– 3 May 2019). See https://imag.umontpellier.fr/~di-pietro/poems2019.html, where slides and posters from the conference can be found

*2019* Organizer of the mini-symposium *Theoretical and computational advances in polygonal and polyhedral methods*, MAFELAP 2019 (Brunel University, London)

*2019–pres.* Co-organizer of the *Numerical Algebraic Geometry and Algebraic Numerical Analysis (NAGANA)* workgroup at IMAG. See https://imag.umontpellier.fr/~di-pietro/nagana.html

*2017* Organizer of the mini-symposia *Polyhedral Methods and Applications* and *Recent advances on polyhedral discretizations*, ENUMATH 2017 international conference (Bergen, Norway)

*2016* Coordinator of the **IHP thematic quarter** *Numerical Methods for PDEs*. The quarter included one summer school and three international conferences:

- Introductory school (IESC, Corse, 5–9 Sept. 2016)
- *Advanced numerical methods: recent developments, analysis, and applications* (IHP, 3–7 Oct. 2016)
- *Recent developments in numerical methods for model reduction* (IHP, 7–10 Nov. 2016)
- *Industry and mathematics* (IHP, 21–23 Nov. 2016)

Detailed information at https://imag.umontpellier.fr/~di-pietro/ihp-nmpdes.html An IHP thematic quarter requires two years of preparation after the project is selected. A book and two special issues resulted from this thematic quarter:

- D. A. Di Pietro, A. Ern, and L. Formaggia, eds. *Numerical Methods for PDEs. State of the Art Techniques*. Vol. 15 SEMA-SIMAI. Springer International Publishing, 2019. ISBN: 978-3-319-94675-7 (Hardcover) 978-3-319-94676-4 (eBook). DOI: 10.1007/978-3-319-94676-4.
- P. F. Antonietti, J. Droniou, and R. Eymard, eds., *Special Issue: Advanced Numerical Methods: Recent Developments, Analysis and Applications*, Computational Methods in Applied Mathematics, Volume 18, Issue 3.
- T. Leliévre, S. Perotto, G. Rozza, eds. *Special Issue on Model Reduction*, Journal of Scientific Computing, Volume 81, Issue 1. ISSN: 0885-7474 (Print) 1573-7691 (Online).

*2007* Organizer of the international workshop *Discontinuous Galerkin Methods: From theoretical developments to industrial applications* (Bergamo, Italy)

## 3.4 Selection of recent invited presentations

For some of the following presentations, slides (and, occasionally, videos) are available on my web page http://imag.umontpellier.fr/~di-pietro.

### 3.4.1 Outside France (selection 2011–pres.)

*May 2024* Invited doctoral seminar at Scuola Superiore Meridionale, Napoli
*Feb. 2024* Invited conference at Collegio Ghislieri, Pavia
*Feb. 2024* Invited doctoral seminar at Università di Bergamo
*May 2023* Invited speaker at M2P, minisymposium *Numerical methods for coupled problems in geometrically complex domains*
*May 2023* Invited seminar at MOX, Politecnico di Milano
*July 2022* Invited speaker at SIAM AN22, minisymposium *Recent developments in mathematical analysis and numerics for incompressible flow and related problems*. Upcoming
*June 2022* Invited speaker at ECCOMAS 2022, minisymposia *Structure preserving and adaptive polytopal methods*, *Structure-Preserving Finite Element Methods in Computational Fluid Dynamics*, and *Multi-scale and multi-level numerical methods for non-linear solids*, Oslo (Norway). Upcoming
*May 2022* Plenary speaker at *100 years Unione Matematica Italiana – 800 years Università di Padova* conference
*Jan. 2022* Colloquium talk at École Polytechnique Fédérale de Lausanne
*May 2021* Invited seminar at Dipartimento di Matematica *Tullio Levi-Civita*, Università di Padova (Italy)
*April 2021* Invited speaker at the Bi.discrete seminar, Universität Bielefeld (Germany). Seminar held remotely owing to the COVID-19 crisis
*Mar. 2021* Invited speaker at the SIAM Conference on Computational Science and Engineering, minisymposium *Compatible Discretizations for Models in Magnetostatics, Magnetohydrodynamics and Fluid Flow*, Fort Worth, Texas (US). Conference in hybrid mode after the COVID-19 crisis
*Jan. 2021* Keynote lecturer at the Oberwolfach thematic week *Nonstandard Finite Element Methods*
*Nov. 2020* Invited seminar at Dipartimento di Matematica *Tullio Levi-Civita*, Univ. Padova (Italy). Seminar held remotely owing to the COVID-19 crisis
*Jul. 2020* Invited speaker at the ICOSAHOM conference, minisymposium *High order methods on polyhedral meshes*, Vienna (Austria). Held remotely in 2021 owing to the COVID-19 crisis
*May 2020* Keynote speaker at the InDAM Workshop *Polygonal methods for PDEs: Theory and applications*, Rome (Italy). Held remotely in 2021 owing to the COVID-19 crisis
*Jul. 2019* Invited speaker at the ICIAM 2019 international conference (Valencia, Spain), minisymposium *Polygonal and polyhedral methods in Applied Mathematics*
*June 2019* Invited speaker at the MAFELAP 2019 international conference (Brunel University, UK), minisymposium *High Performance Finite Element Technique*
*Mar. 2019* Invited seminar at SISSA (Italy)
*Oct. 2018* Invited seminar at Univ. Udine (Italy)
*May 2018* STaRs (*Supporting Talented Researchers*) invited seminar (4h) at Univ. Bergamo (Italy)
*Dec. 2017* Invited seminar at Univ. Bergamo (Italy)
*July 2017* Plenary speaker at the *POEMS 2017* international workshop (Univ. Milano Bicocca)
*July 2017* Invited doctoral mini-course at Univ. Bergamo
*Dec. 2016* Invited seminar at MOX, Politecnico di Milano (Italy)
*June 2016* Invited speaker at the MAFELAP 2016 conference, Brunel University (UK), minisymposia *PDE discretization methods on polygonal and polyhedral meshes* and *Hybridizable discontinuous Galerkin methods*
*May 2016* Invited speaker at the ZHACM Colloquium, Univ. Zürich-ETHZ (Swiss)
*Feb. 2016* Invited seminar at Univ. di Pavia-IMATI (Italy)

*Sept. 2015* Invited speaker at the *eXtended Discretization Methods 2015* conference, minisymposium *Polygonal and polyhedral methods*, Ferrara (Italy)
*July 2015* Invited lecturer for the PhD course *An introduction to Hybrid High-Order methods*, Univ. di Bergamo
*Feb. 2015* Invited seminar at Univ. Milano Bicocca (Italy)
*July 2014* Invited speaker at the *World Congress on Computational Mechanics XI*, minisymposium *Structure-preserving and polyhedral discretizations* (Barcelona, Spain)
*Feb. 2013* Invited seminar at MOX, Politecnico di Milano (Italy)
*Dec. 2011* Invited seminar at Univ. Bergamo (Italy)
*June 2011* Invited plenary speaker at the *Finite Volumes for Complex Applications VI* conference, Prague (Czech Republic)
*May 2011* Invited seminar at the Department of Mathematics, Univ. of Sussex (UK)

#### 3.4.2 In France (selection 2011–pres.)

*Mar. 2024* Invited presentation at the ANR HIPOTHEC kick-off workshop, Wissant
*Oct. 2023* Invited seminar at Laboratoire Jacques-Louis Lions
*June 2023* Lecturer at the école d'été EDF-CEA-INRIA *Discrétisations polyédriques robustes pour la mécanique numérique* (EDF Lab, Paris)
*June 2023* Invited speaker at the *Journées d'Occitanie en Mathématiques Appliquées*, Perpignan
*Mar. 2023* Keynote speaker at the *Journées Ondes du Sud-Ouest 2023*, Onera, Toulouse
*Dec. 2022* LMA2S seminar at Onera (in virtual mode)
*Dec. 2021* Keynote speaker at the SimRace workshop, IFPEN, Rueil-Malmaison
*Dec. 2020* NAGANA seminar at IMAG, Univ. Montpellier
*July 2020* Keynote speaker at the session *Advances in polygonal and polyhedral methods*, WCCM-ECCOMAS 2020, Paris. Held in virtual mode in 2021 owing to the COVID-19 crisis
*Dec. 2019* Invited seminar at IFP Energies Nouvelles
*Sept. 2019* Invited seminar at Laboratoire de Mathématiques de Besançon
*May 2019* Invited seminar at Laboratoire J. A. Dieudonné, Nice
*May 2018* Invited speaker at the minisymposium on *Polyhedral methods and applications*, *44e Congrès National d'Analyse Numérique*, Cap d'Agde
*Nov. 2017* Invited plenary speaker at the *Journées Multiphasiques et Incertitudes* Nantes
*Apr. 2017* Invited seminar at UMPA, Lyon
*Mar. 2017* Invited seminar at Institut de Mathémathiques de Bordeaux
*Sept. 2016* Invited seminar at *EDF research lab Chatou*, Paris
*Sept. 2016* Invited seminar at the *Laboratoire de Mécanique et Génie Civil*, Univ. de Montpellier
*May 2016* Invited lecturer at the *Journées Numériques*, Laboratoire Jean Dieudonné, Univ. de Nice
*June 2015* Invited lecturer at the CEA-EDF-INRIA school *New Trends in Compatible Discretizations* (Paris)
*June 2015* Invited lecturer at the international workshop *Méthode de Galerkine discontinue et ses applications*, CNAM, Paris
*June 2015* Invited lecturer at the *École de de Mécanique des Fluides Numérique 2015* (Porquerolles, France)
*Mar. 2015* Invited seminar at Départment de Mathématiques d'Orsay, Univ. Paris 11
*Jan. 2015* Invited seminar at Institut Camille Jordan, Lyon
*Oct. 2014* Invited seminar at Saint-Gobain-CNRS research unit *Surface du Verre et Interfaces*, Paris Aubervilliers
*Jan. 2014* Invited seminar at EDF research lab Clamart, Paris
*Oct. 2013* Invited seminar at I2M, Aix–Marseille Univ.
*June 2013* Invited lecturer at the *École de de Mécanique des Fluides Numérique 2013* (Porquerolles, France)
*Jan. 2013* Invited seminar at LAMSID, EDF, Paris Clamart
*Dec. 2012* Invited seminar at Laboratoire J. A. Dieudonné, Nice

*Oct. 2012* Invited speaker at the workshop *Innovative schemes and highly performing methods for the numerical simulation of fluid flows*, Marseille
*Apr. 2012* Invited speaker at the *Workshop on complex grids and fluid flows*, Lyon
*Dec. 2011* Invited seminar at Laboratoire de Mathématiques de Besançon
*Nov. 2011* Invited seminar at Institut de Mathématiques de Bordeaux
*May 2011* Invited seminar at LAGA, Univ. Paris 13

### 3.5 Press

*2023* Portrait "Talents CNRS" (https://www.insmi.cnrs.fr/fr/personne/daniele-di-pietro)
*2015* MaddMaths interview by M. Briani (in Italian): *Daniele Di Pietro: l'analisi numerica come antidoto contro noia e frustrazione*, rubrica *Giovani matematici crescono*

## 4 Research funding track-record

### 4.1 Academic research projects

#### 4.1.1 As Principal Investigator (PI)

| Reference | Timeframe | Funding | Description |
|---|---|---|---|
| **ERC 101115663 (NEMESIS)** | 2024–2029 | 2 379 506€ | ERC Synergy grant (tot. 7 818 782€). The other PIs are P. Antonietti (Politecnico di Milano), L. Beirão da Veiga (Università Milano Bovisa), and J. Droniou (CNRS) |
| DICE (Région Occitanie) | 2022–2025 | 51 790€ | Co-funding for the PhD thesis of M. Salah |
| ANR-16-IDEX-0006 (RHAMNUS) | 2021–2023 | 75 000€ | Funding for an 18-months post-doctoral fellow |
| ANR-20-MRS2-0004 (NEMESIS) | 2020–2022 | 23 281€ | *New methods for numerical simulations*. MRSEI funding scheme |
| ANR-10-LABX-0002-01 | 2017–2018 | 47 700€ | Co-funding for the project *Development of an HHO method for the direct simulation of turbulent flows in Code_Saturne* |
| ANR-15-CE40-0005 (HHOMM) | 2015–2019 | 172 224€ | *Hybrid High-Order Methods on polyhedral Meshes*. Only JCJC project in Numerical Analysis funded in the 2015 call. Details at http://imag.umontpellier.fr/~di-pietro/HHOMM.html |
| NUMEV 2014-2-006 | 2015–2018 | 50 000€ | Co-funding for the PhD thesis of M. Botti |
| UFI Vinci | 2015–2018 | 90 000€ | PhD thesis of F. Chave |
| ERT IFPEN-LJLL | 2008–2013 | 220 000€ | *Enhanced oil recovery and geological sequestration of $CO_2$: mesh adaptivity, a posteriori error control, and other advanced techniques*, co-PI with M. Vohralík |

#### 4.1.2 As unit coordinator or co-investigator

| Reference | Timeframe | Role | Funding | Description |
|---|---|---|---|---|

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|---|---|---|---|---|
| MSCA EffECT | 2024–2026 | MSCA supervisor | 195 914€ | *Breaking frontiers of Eddy Current Testing simulations through Discrete De Rham methods* (PI: S. Pitassi) |
| ANR HIPOTHEC | 2023–2028 | Unit coordinator | 604 193€ | *HIgh-order POlyhedral meTHods for Eddy Current testing simulations* (PI: S. Lemaire) |
| ANR MSMΦ* | 2023–2027 | Co-investigator | 268 276€ | *Partial differential equations for MultiScale and MultiPhysics modelling* (PI: M. Hillairet) |
| ANR fast4hho | 2017–2021 | Unit coordinator | 465 686€ | *Fast Solvers for robust discretisations in CFD* (PI: F. Hülsemann) |
| ANR HAMM | 2010–2014 | Co-investigator | 1 060 721€ | *Hybrid Architectures and Multiscale Methods* (PI: C. Prud'homme) |
| ANR VFSit-Com | 2009–2012 | Co-investigator | 180 000€ | *Volumes Finis pour Situations Complexes* (PI: J. Droniou) |

### 4.2 Industrial collaborations as PI

| **Reference** | **Timeframe** | **Funding** | **Description** |
|---|---|---|---|
| IFPEN | 2022–2025 | 142 500€ | Funding for the PhD thesis of A. Crippa + scientific collaboration (39 000€) |
| EDF | 2018–2021 | 135 000€ | Funding for the PhD thesis of I. Fontana + scientific collaboration (45 000€) |
| EDF | 2017–2020 | 36 000€ | Co-funding for the project *Development of an HHO method for the direct simulation of turbulent flows in Code_Saturne* |
| BRGM | 2014–2018 | 60 000€ | Co-funding for the PhD thesis of M. Botti |
| Saint-Gobain | 2015–2016 | 15 000€ | *Hybrid High-Order methods for the Cahn–Hilliard equation*, fundamental research program Phi-Zero |
| EDF | 2014–2017 | 135 000€ | Funding for the PhD thesis of R. Riedlbeck + scientific collaboration (45 000€) |

## 5 Supervision of doctoral and post-doctoral fellows

### 5.1 Supervision of PhD students

*2022–pres.* **Alessandra Crippa**, HHO methods for fracture propagation

*2022–pres.* **Marwa Salah**, Discrete elasticity complexes

*2021–pres.* **Aurelio Edoardo Spadotto**, Numerical simulation of the electrodeformation of blood cells. Application to medical diagnostic, co-director with S. Mendez (UM)

*Def. 2022* **Ilaria Fontana**, Interface models for dam modelling, in collaboration with EDF. TEL manuscript tel-03703584. Ilaria Fontana is now Visiting Assistant Professor at Northwestern University

*Def. 2021* **André Harnist**, Hybrid High-Order methods for complex problems in fluid mechanics TEL manuscript tel-03518264. A. Harnist is now Associate Professor (Maître de Conférences) at Université de Technologie de Compiègne

*Def. 2021* **Pierre Matalon**, Fast solvers for robust discretizations in computational fluid dynamics, co-director with U. Rüde (FAU). TEL manuscript tel-03401691. P. Matalon is now post-doctoral researcher at MOX, Politecnico di Milano

*Def. 2018* **Michele Botti**, Advanced polyhedral discretization methods for poromechanical modelling, in collaboration with BRGM. TEL manuscript tel-01871074. M. Botti has obtained a Marie Sklodowska–Curie fellowship then a Researcher position (RTD-A) at MOX, Politecnico di Milano

*Def. 2018* **Florent Chave**, Hybrid High-Order methods for interface problems. TEL manuscript tel-01881007. F. Chave is now engineer at EPSILON-ALCEN (Montpellier)

*Def. 2017* **Rita Riedlbeck**, A posteriori-based adaptive algorithms for poro-mechanics. TEL manuscript tel-01676709. R. Riedlbeck is now research manager at TWT

*Def. 2016* **Joubine Aghili**, Numerical resolution of partial differential equations with variable coefficients. TEL manuscript tel-01616910. J. Aghili is now Associate Professor (*Maître de Conférences*) at University of Strasbourg

*Def. 2013* **Jean-Marc Gratien**, Development of a domain-specific embedded language for lowest-order methods on general meshes. TEL manuscript tel-00926232. Co-director with C. Prud'homme (professor, Univ. Strasbourg). J.-M. Gratien is now research engineer at IFPEN

*Def. 2013* **Simon Lemaire**, Hybrid finite volume methods for poro-mechanics. TEL manuscript tel-00957292. Co-supervisor with R. Eymard (professor, Univ. Paris-Est). S. Lemaire is now researcher (*Chargé de Recherche*) at INRIA

*Def. 2013* **Soleiman Yousef**, A posteriori error estimates and adaptivity for the SAGD proceeding, co-supervisor with M. Vohralík (senior researcher, INRIA) and V. Girault (professor, UPMC — Univ. Pierre et Marie Curie). S. Yousef is now research engineer at IFPEN

I also supervised the PhD students **Mathias Dauphin** (Università di Napoli Federico II, Italy) during his 3-months stay at IMAG (2023–2024), **Silvano Pitassi** (Università di Udine, Italy) during his 2-months stay at IMAG (2021), **Lorenzo Botti** (Università di Bergamo, Italy) and **Sissel Mundal** (University of Bergen) during their 6 months stay at IFPEN.

### 5.2 Supervision of post-doctoral fellows

*2023* **Marien Hanot**, DDR methods for the elasticity complex

*2021–2022* **Francesco Bonaldi**, DDR methods for the incompressible Navier–Stokes equations. F. Bonaldi is now Maître de Conférences at Université de Perpignan

*2017–2019* **Daniel Castanon Quiroz**, Advanced implementation of Hybrid High-Order methods. D. Castanon Quiroz is now Assistant Professor at UNAM (Mexico City)

*2018* **Saghar Heidari**, Advanced aspects of Hybrid High-Order methods for applications in computational physics. S. Heidari is now researcher at Shahid Beheshti University (Iran)

*2017–2018* **Alice Raeli**, Hybrid High-Order methods on octree meshes. A. Raeli is now research assistant at Politecnico di Torino, Italy

*2016–2017* **Francesco Bonaldi**, Advanced discretization methods for plate problems

*2016–2017* **Roberta Tittarelli**, A posteriori error estimators for incompressible problems. R. Tittarelli is now Associate Professor (*Maître de Conférences*) at Université de Besançon

*2008–2009* **Ivan Kapyrin**, Multi-points finite volume methods for porous media flows. I. Kapyrin is now Senior Researcher at the Institute of Numerical Mathematics of the Russian Academy of Sciences

### 5.3 Participation in PhD theses and HDR[1] committees (* Referee)

*2023* M. Hanot (PhD, UM)

*2022* S. Pitassi* (PhD, Università di Udine)

*2021* L. Sokhna (PhD, UM), S. Krell (HDR, Université de Nice Côte d'Azur)

*2019* C. Facciolà* (PhD, Politecnico di Milano)

*2018* C. Marcati* (PhD, Université Pierre et Marie Curie)

[1]French habilitation for professorship

*2017* A. Raeli* (PhD, Université de Bordeaux), A. Della Rocca* (PhD, Politecnico di Milano, Italy), S. Zonca (PhD, Politecnico di Milano, Italy)
*2016* R. Porcù* (PhD, Politecnico di Milano, Italy), K. Haddaoui* (PhD, Université Pierre et Marie Curie)
*2015* V. Baron* (PhD, Univ. Nantes, France), K. Mallem* (PhD, Aix-Marseille Univ., France)
*2014* J. Bonelle (PhD, EDF-Univ. Paris-Est), A. Duran (PhD, UM)
*2013* S. Gérald* (PhD, ONERA-UPMC, referee), M. Cathala (PhD, UM), A. Baldit (PhD, UM)
*2012* J. Richard (PhD, UM), T. Hai Ong* (PhD, Univ. Paris-Est, France).

# 6 Teaching activities

## 6.1 Post-graduate courses (PhD level)

*2024* *An overview of polytopal approximations of partial differential equations* (1h), Scuola Superiore Meridionale (Napoli)
*2024* *An introduction to Discrete de Rham (DDR) methods* (1h), Università di Bergamo (Italy)
*2023* *An introduction to Discrete de Rham (DDR) methods* (2.5h), École d'été CEA-EDF-Inria
*2018* *An introduction to the convergence analysis of discretisation methods for PDEs with application to Hybrid High-Order methods* (4h), Univ. Bergamo (Italy)
*2016* *Hybrid High-Order methods* (6h), Institut Henri Poincaré (Paris), cf. http://imag.umontpellier.fr/event/ihp-nmpdes
*2016* *An introduction to Hybrid High-Order methods* (3h), Università di Bergamo (Italy)
*2015* *Hybrid High-Order methods and applications* (18h), doctoral school *Information, Structures et Systèmes*, Univ. Montpellier
*2015* *Discontinuous Galerkin methods and applications* (4h), École de Mécanique des Fluides Numériques (Porquerolles, France)
*2016* *An introduction to Hybrid High-Order methods* (3h), Università di Bergamo (Italy)
*2013* *Discontinuous Galerkin methods and applications* (6h), École de Mécanique des Fluides Numériques (Porquerolles, France)
*2012* *Discontinuous Galerkin methods and applications* (20h), doctoral school I2S, Univ. Montpellier

## 6.2 Undergraduate courses

**Legend:** CM = *Cours Magistral* (Masterclass), TD = *Travaux Dirigés* (Exercices), TP = *Travaux Pratiques* (Practical exercises). In France 1h CM = 1.5h TD, 1h TD = 1.5h TP; L$X$ = $X$th year of Licence, M$X$ = $X$th year of Master

### 6.2.1 As professor at University of Montpellier

*2023–2024* **Analyse Numérique 4** (M2, 33 CM), **Optimisation** (M2, 12CM + 12TD)
*2022–2023* **Analyse Numérique 4** (M2, 33 CM), **Algèbre Linéaire Numérique** (L2, 15 CM + 10.5 TD)
*2021–2022* **Analyse Numérique 4** (M2, 33 CM), **Algèbre Linéaire Numérique** (L2, 15 CM + 10.5 TD)
*2020–2021* **Analyse Numérique 3** (M2, 33 CM), **Modélisation Numérique** (M2, 8CM), **Analyse Numérique Matricielle** (L2, 18 CM + 10.5 TD + 13.5 TP)
*2019–2020* **Analyse Numérique 3** (M2, 33 CM), **Analyse Numérique Matricielle** (L2, 18 CM + 10.5 TD + 9 TP)
*2018–2019* **Analyse Numérique 3** (M2, 33 CM), **Modélisation Numérique** (M2, 7 CM), **Analyse Numérique Matricielle** (L2, 21 CM + 12 TD + 15 TP), **Analyse et Algèbre** (L1, 48 TD), **Biomaths** (L1, 24 TD)
*2017–2018* **Analyse Numérique 3** (M2, 33 CM), **Modélisation Numérique** (M2, 7 CM), **Analyse Numérique Matricielle** (L2, 21 CM + 12 TD)

*2016–2017* **Analyse Numérique des EDP 3** (M2, 33 CM), **Analyse Numérique Matricielle** (L2, 21 CM + 12 TD)
*2015–2016* **Analyse Numérique des EDP 3** (M2, 33 CM), **Analyse Numérique Matricielle** (L2, 21 CM + 12 TD), **Algèbre Linéaire et Analyse 1** (2 x 48 TD)
*2014–2015* **Calcul scientifique et Applications** (M2, 28 CM), **Algèbre Linéaire Analyse 1** (48 TD), **Optimisation numérique** (M1, 24 CM + 15 TD + 12 TP), **Biomaths** (L1, 36 TD)
*2013–2014* **Calcul scientifique et Applications** (M2, 30 CM), **Algèbre Linéaire Analyse 1** (78 TD + 6 CM)
*2012–2013* **Calcul scientifique et Applications** (M2, 30 CM), **Algèbre Linéaire Analyse 1** (78 TD + 6 CM), **Analyse Numérique Matricielle** (21 CM + 12 TD)

For most of the above courses, supports are available on my webpage http://imag.umontpellier.fr/~di-pietro.

#### 6.2.2 Other undergraduate courses in France

UPMC = Université Pierre et Marie Curie (Paris 6)

*2011–2012* **Discontinuous Galerkin Methods and Applications** (M2, UPMC, 24h CM), **Calcul Scientifique** (L3, Ecole des Ponts ParisTech, 27 CM)
*2010–2011* **Discontinuous Galerkin Methods and Applications** (M2, UPMC, 24h CM), **Calcul Scientifique** (L3, Ecole des Ponts ParisTech, 27 CM)
*2009–2010* **Discontinuous Galerkin Methods and Applications** (M2, UPMC, 24h CM), **Calcul Scientifique** (L3, Ecole des Ponts ParisTech, 27 CM)
*2008–2009* **Discontinuous Galerkin Methods and Applications** (M2, UPMC, 10 CM), **Calcul Scientifique** (L3, Ecole des Ponts ParisTech, 27 CM)
*2007–2008* **Calcul Scientifique** (L3, Ecole des Ponts ParisTech, 27 CM)

#### 6.2.3 Supervision of master theses (* PhD thesis under my direction followed)

*2023* **Giulia Quarta Castelbarco Albani** (2023), co-advisor with P. Antonietti, L. Beirão da Veiga, and J. Droniou
*2022* **Marwa Salah*** (3–8/2022), DDR methods for problems in continuum mechanics
*2022* **Alessandra Crippa*** (2–8/2022), HHO methods for interface problems
*2021* **Aurelio Edoardo Spadotto***, HHO methods for magnetostatics
*2020* **Rafiq Driss**, de Rham cohomology for an HHO discretization of the Maxwell equations
*2019* **Isaak Bachache**, A numerical exploration of Finite Element Exterior Calculus
*2019* **Hind Bouyri**, Implementation of Hybrid High-Order methods for convective terms in Code_Saturne, in collaboration with EDF
*2019* **Alessandra Guglielmana**, A low-order method for linear elasticity on general meshes
*2018* **André Harnist***, Applications of Hybrid High-Order methods to computational mechanics
*2016* **Bastien Hamlat**, Discontinuous Galerkin methods for free-surface flows
*2015* **Michele Botti***, Nonconforming discretization methods for poro-mechanics
*2015* **Florent Chave***, Hybrid High-Order methods for the Cahn–Hilliard problem, in collaboration with Saint–Gobain
*2013* **Rita Riedlbeck***, Spectral methods for the incompressible Navier–Stokes equations
*2009* **Soleiman Yousef***, Finite volume methods for petroleum reservoir modelling
*2005* **Nicoletta Franchina**, Discontinuous Galerkin methods for problems in fluid mechanics
*2004* **Pietro Gabbiadini**, Development of a Matlab code for brake modelling, in collaboration with Freni Brembo

# 7 Institutional responsibilities

## 7.1 Main responsibilities

*2021–pres.* **Director of IMAG**
*2022–pres.* *Correspondant recherche* for the Department of Mathematics
*2019–2020* **Deputy director of IMAG**
*2014–2020* Head of the **ACSIOM research team**
*2014–2020* Member of the board of directors of **IMAG**
*2015–2019* In charge of the second year of the Master *Modeling and Numerical Analysis*
*2013–2019* Member of the board of the **Department of Mathematics** of the University of Montpellier
*2017–2020* Member of the *Commission de Section 26* (local expert committee for Applied Mathematics)
*2012–2015* In charge of the first year of the Master *Mathématiques, Statistique et Applications*

## 7.2 Participation in selection committees

*2022* Member of the selection committee for a post of **Full Professor** (ref. PR-0342490X-9, Université de Montpellier)
*2020* Member of the selection committee for a post of **Full Professor** (Politecnico di Milano, Italy)
*2019* Member of the selection committee for a post of **Full Professor** (Università di Trento, Italy)
*2016* President of the selection committee for a post of **Associate Professor** (ref. 26MCF99, Université de Montpellier)
*2015* President of the selection committee for a post of **Full Professor** (ref. 2526PR4118, Université de Nîmes, France)
*2014* Member of the selection committee for a post of **Associate Professor** (MAT/08, ref. 2010/MAT3, Politecnico di Milano, Italy)
*2014* President of the selection committee for a post of **Full Professor** (ref. 26PR4171, Université de Montpellier)

# 8 Publications

## 8.1 Research monographs

[1] D. A. Di Pietro and J. Droniou. *The Hybrid High-Order method for polytopal meshes. Design, analysis, and applications*. Vol. 19. Modeling, Simulation and Application. Springer International Publishing, 2020. ISBN: 978-3-030-37202-6. DOI: 10.1007/978-3-030-37203-3.

[2] D. A. Di Pietro and A. Ern. *Mathematical aspects of discontinuous Galerkin methods*. Vol. 69. Mathématiques & Applications (Berlin) [Mathematics & Applications]. Springer, Heidelberg, 2012. ISBN: 978-3-642-22979-4. DOI: 10.1007/978-3-642-22980-0.

## 8.2 Edited books

[3] D. A. Di Pietro, L. Formaggia, and R. Masson, eds. *Polyhedral Methods in Geosciences*. Vol. 27. SEMA-SIMAI. Springer International Publishing, 2021. ISBN: 978-3-030-69362-6. DOI: 10.1007/978-3-030-69363-3.

[4] D. A. Di Pietro, A. Ern, and L. Formaggia, eds. *Numerical Methods for PDEs. State of the Art Techniques*. Vol. 15. SEMA-SIMAI. Springer International Publishing, 2018. ISBN: 978-3-319-94675-7. DOI: 10.1007/978-3-319-94676-4.

### 8.3 Papers in international peer-reviewed journals


[5] L. Beirão da Veiga, D. A. Di Pietro, and K. B. Haile. "A Péclet-robust discontinuous Galerkin method for nonlinear diffusion with advection". In: *Math. Models Methods Appl. Sci.* (2024). Accepted for publication. arXiv: 2402.09814 [math.NA].

[6] D. Castañón Quiroz and D. A. Di Pietro. "A pressure-robust HHO method for the solution of the incompressible Navier–Stokes equations on general meshes". In: *IMA J. Numer. Anal.* 44.1 (2024), pp. 397–434. DOI: 10.1093/imanum/drad007. arXiv: 2203.07180 [math.NA].

[7] D. A. Di Pietro, J. Droniou, and J. J. Qian. "A pressure-robust Discrete de Rham scheme for the Navier–Stokes equations". In: *Comput. Meth. Appl. Mech. Engrg.* 421.116765 (2024). DOI: 10.1016/j.cma.2024.116765. arXiv: 2401.04456 [math.NA].

[8] D. A. Di Pietro and M.-L. Hanot. "A discrete three-dimensional divdiv complex on polyhedral meshes with application to a mixed formulation of the biharmonic problem". In: *Math. Models Methods Appl. Sci.* (2024). Accepted for publication. arXiv: 2305.05729 [math.NA].

[9] I. Fontana and D. A. Di Pietro. "An a posteriori error analysis based on equilibrated stresses for finite element approximations of frictional contact". In: *Comput. Meth. Appl. Mech. Engrg.* 425.116950 (2024). DOI: 10.1016/j.cma.2024.116950. arXiv: 2401.02944 [math.NA].

[10] M. Botti, D. A. Di Pietro, and M. Salah. "A serendipity fully discrete div-div complex on polygonal meshes". In: *Comptes Rendus Mécanique* 351.S1 (2023). DOI: 10.5802/crmeca.150. arXiv: 2207.07194 [math.NA].

[11] D. Castañón Quiroz, D. A. Di Pietro, and A. Harnist. "A Hybrid High-Order method for incompressible flows of non-Newtonian fluids with power-like convective behaviour". In: *IMA J. Numer. Anal.* 43.1 (2023), pp. 144–186. DOI: 10.1093/imanum/drab087.

[12] D. A. Di Pietro. "An arbitrary-order discrete rot-rot complex on polygonal meshes with application to a quad-rot problem". In: *IMA J. Numer. Anal.* (2023). Published online. DOI: 10.1093/imanum/drad045. arXiv: 2210.15581 [math.NA].

[13] D. A. Di Pietro and J. Droniou. "A fully discrete plates complex on polygonal meshes with application to the Kirchhoff–Love problem". In: *Math. Comp.* 92.339 (2023), pp. 51–77. DOI: 10.1090/mcom/3765. arXiv: 2112.14497 [math.NA].

[14] D. A. Di Pietro and J. Droniou. "A polytopal method for the Brinkman problem robust in all regimes". In: *Comput. Meth. Appl. Mech. Engrg.* 409.115981 (2023). DOI: 10.1016/j.cma.2023.115981. arXiv: 2301.03272 [math.NA].

[15] D. A. Di Pietro and J. Droniou. "An arbitrary-order discrete de Rham complex on polyhedral meshes: Exactness, Poincaré inequalities, and consistency". In: *Found. Comput. Math.* 23 (2023), pp. 85–164. DOI: 10.1007/s10208-021-09542-8. arXiv: 2101.04940 [math.NA].

[16] D. A. Di Pietro and J. Droniou. "Homological- and analytical-preserving serendipity framework for polytopal complexes, with application to the DDR method". In: *ESAIM: Math. Model Numer. Anal.* 57.1 (2023), pp. 191–225. DOI: 10.1051/m2an/2022067. arXiv: 2203.02939 [math.NA].

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[18] D. A. Di Pietro, P. Matalon, P. Mycek, and U. Rüde. "High-order multigrid strategies for HHO discretizations of elliptic equations". In: *Numer. Linear Algebra with Appl.* 30.e2456 (2023). DOI: 10.1002/nla.2456.

[19] L. Beirão da Veiga, F. Dassi, D. A. Di Pietro, and J. Droniou. "Arbitrary-order pressure-robust DDR and VEM methods for the Stokes problem on polyhedral meshes". In: *Comput. Meth. Appl. Mech. Engrg.* 397.115061 (2022). DOI: 10.1016/j.cma.2022.115061. URL: https://authors.elsevier.com/a/1fChmAQEIzVqH.

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[22] D. A. Di Pietro and J. Droniou. "A discrete de Rham method for the Reissner–Mindlin plate bending problem on polygonal meshes". In: *Comput. Math. Appl.* 125 (2022), pp. 136–149. DOI: 10.1016/j.camwa.2022.08.041. arXiv: 2105.11773 [math.NA].

[23] D. A. Di Pietro, I. Fontana, and K. Kazymyrenko. "A posteriori error estimates via equilibrated stress reconstructions for contact problems approximated by Nitsche's method". In: *Comput. Math. Appl.* 111 (2022), pp. 61–80. DOI: 10.1016/j.camwa.2022.02.008. URL: https://authors.elsevier.com/c/1egEh3CDPQ2-a5.

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