# André HARNIST

# Curriculum Vitæ







andre.harnist@utc.fr

# ---- Current position -----

2023 – pres. Maître de conférences (Assistant Professor) at Université de Technologie de Compiègne, France CNU section 26 Applied mathematics and mathematics Laboratory Laboratory of Applied Mathematics of Compiègne (LMAC)

Team Inverse problems and numerical analysis (EPIA)

## ----- Research interests -----

Theoretical and numerical analysis of PDEs Advanced PDE discretization methods A priori and a posteriori error estimates Fluid and solid mechanics Linear and non-linear elasticity non-Newtonian fluids



# 2018 – 2021 **Ph.D. in Mathematics and Modeling** at IMAG, University of Montpellier, France Team ACSIOM – Supervised by Daniele A. Di Pietro

Title Hybrid High-Order methods for complex problems in fluid mechanics Defense date Oct. 11, 2021

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Jury	Daniele A. Di Pietro	University of Montpellier	Supervisor
	Jérôme Droniou	Monash University	Examiner
	Stella Krell	University of Nice	Examiner
	Pauline Lafitte	University of Paris-Saclay	President
	Marco Verani	Politecnico di Milano	Referee
	Martin Vohralík	Inria of Paris	Referee
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Funding I2S doctoral school, 1st place at the doctoral admission exam

- 2016 2018 **M.Sc. in Mathematics** with distinction "Très Bien" at the University of Montpellier, France Option Modeling and Numerical Analysis of PDEs
- 2013 2016 **B.Sc. in Mathematics** with distinction "Bien" at the University of La Rochelle, France Options Research, Teaching



- 2021 2023 **Post-doctoral researcher in Applied Mathematics** at Inria of Paris, France Topics Adaptive numerical schemes integrating discretization, regularization, linearization, *and algebraic resolution*
- 2022 2023 **Part-time teacher in Applied Mathematics** at IPSA of Paris, France Topics Numerical analysis of PDEs, Bilinear algebra, Integration, Programming in Python
  - 12/2021 **Part-time teacher in Applied Mathematics** at Sorbonne Paris Nord University, France (2 months) Topics Pogramming in Matlab, Fourier Transform, Convolution
- 2018 2021 **Ph.D. candidate with teaching activities** at IMAG, University of Montpellier, France Title Hybrid High-Order methods for complex problems in fluid mechanics Supervisor Daniele A. Di Pietro
  - 03/2021 **Research intern** for 6 months at IMAG, University of Montpellier, France Title Hybrid-High Order method for creeping flows of power-law fluids Supervisor Daniele A. Di Pietro
  - 03/2016 **Research intern** for 5 weeks at MIA, University of La Rochelle, France Title *Modelization of the growth of tree leaves by the algorithm of Qinglan Xia* Supervisor Michel Berthier

## — Courses and workshops —

- 01/2023 **35th seminar on numerical fluid mechanics of CEA-SMAI/GAMNI** at Paris, France Topics Modelling, Numerical simulation, Mathematical analysis in fluid mechanics
- 12/2022 **IFPEN Inria workshop** at Inria Paris, France Topics Numerical methods, Large linear and nonlinear systems, Machine learning
- 01/2022 **34th seminar on numerical fluid mechanics of CEA-SMAI/GAMNI** at Paris, France Topics Modelling, Numerical simulation, Mathematical analysis in fluid mechanics
- 2019 2021 **NAGANA workgroup** at IMAG, University of Montpellier, France Topics Numerical algebraic geometry, Algebraic numerical analysis
  - 12/2021 Workshop SimRace at IFP, Paris, France Topics Numerical analysis of PDEs
  - 06/2021 **NEMESIS workshop**, online (2 days) Topics New generation methods for numerical simulations

2019 – 2020 Series of advanced courses to teach in higher education at the University of Montpellier, France Courses How to have an innovative pedagogy? (21h) Why and how to develop interactive courses? (6h) Training to teach in higher education (20h) Introduction to teaching tools for higher education (20h) Prepare, organize and conduct a course (14h) Public speaking for teaching activities (21h)

- 11/2019 XXI Louis Antoine days at IRMAR, Rennes, France (2 days) Topics Numerical analysis, Fluid mechanics, Functional analysis
- 01/2019 **Research integrity in scientific professions**, online (16h)

# — Teaching activities —

2022 – 2023	<ul> <li>Linear systems and numerical resolution (2nd year B.Sc.) at IPSA of Paris, France</li> <li>Role Person in charge (Lesson planning, Lecture, Tutorial classes, Exam), 20h</li> <li>Topics Gauss method, LU decomposition, Cholesky, Programming in Python</li> </ul>		
	Differentiable Optimization with the descent method (3rd year B.Sc.) at IPSA of Paris, France Role Tutorial classes, 24h		
	lopics Quadratic forms, Optimization, Regression, Programming in Python		
	<b>Differentiable Optimization with direct and dual methods (3rd year B.Sc.)</b> at IPSA of Paris, France Role, Tutorial classes, 28h		
	Topics Quadratic forms, Optimization, Regression, Programming in Python		
	Mathematics and physics (1st year B.Sc.) at IPSA of Paris, France		
	Role Tutorial classes, 12h Topics Derivative and differential, Integrals, Geometry		
2021 – 2022	Differentiable Optimization (3rd year B.Sc.) at IPSA of Paris, France Role Tutorial classes, 32h		
	Topics Quadratic forms, Optimization, Regression, Programming in Python		
	Quadrature and numerical resolution of ODEs (3rd year B.Sc.) at IPSA of Paris, France		
	Topics Numerical integration, Calculus, Programming in Python		
	Finite difference methods (3rd year B.Sc.) at IPSA of Paris, France		
	Role Tutorial classes, 6h Topics Finite difference resolution of PDEs, Programming in Python		
	Image processing with Matlab (1st year B.Sc.) at Sorbonne Paris Nord University, France Role Tutorial classes, 12h Topics Programming in Matlab, Fourier Transform, Convolution		
2020 – 2021	<ul> <li>Mathematics of decision (3rd year B.Sc.) at Polytech Montpellier, France</li> <li>Role Person in charge (Lesson planning, Lecture, Tutorial classes, Exam), 64h</li> <li>Topics Programming in Python, Matrices, Linear systems, Gauss Elimination,</li> <li>Linear optimization problems, Simplex algorithm</li> </ul>		
2019 – 2020	Analysis and algebra 2 (1st year B.Sc.) at Polytech Montpellier, France Role Tutorial classes, 24h Topics Vector spaces, Integration, Limited developments		
	<ul> <li>Analysis and algebra 1 (1st year B.Sc.) at the University of Montpellier, France Role Tutorial classes, 42h</li> <li>Topics Logic, Calculus, Integration, Vector spaces</li> </ul>		
2018 – 2019	<ul> <li>Analysis and algebra 2 (1st year B.Sc.) at Polytech Montpellier, France</li> <li>Role Tutorial classes, 42h</li> <li>Topics Vector spaces, Integration, Limited developments</li> </ul>		
	Numerical analysis (2nd year B.Sc.) at the University of Montpellier, France Role Tutorial classes, 10h Topics Programming in Matlab, Solving linear systems, LU decomposition		
	<ul> <li>Introduction to scientific software (2nd year B.Sc.) at the University of Montpellier, France Role Tutorial classes, 12h</li> <li>Topics Programming in Matlab, Numerical precision, Functions with several variables</li> </ul>		



### - Preprints -

03/2023 **Robust energy a posteriori estimates for nonlinear elliptic problems** A. Harnist, K. Mitra, A. Rappaport et M. Vohralík Preprint, 2023 HAL hal-04033438

#### — Articles —

- 06/2021 A Hybrid High-Order method for incompressible flows of non-Newtonian fluids with power-like convective behaviour
   D. Castanon Quiroz, D. A. Di Pietro, and A. Harnist
   IMA J. Numer. Anal., 2021. Published online
   DOI 10.1093/imanum/drab087
- 12/2020 Improved error estimates for Hybrid High-Order discretizations of Leray-Lions problems D. A. Di Pietro, J. Droniou, and A. Harnist Calcolo, 2021, Volume 58, Issue 19 DOI 10.1007/s10092-021-00410-z
- 03/2020 A Hybrid High-Order method for creeping flows of non-Newtonian fluids M. Botti, D. Castanon Quiroz, D. A. Di Pietro, and A. Harnist ESAIM: M2AN, 2021, 55(5):2045–2073 DOI 10.1051/m2an/2021051

— Theses —

10/2021 Méthodes Hybrid High-Order pour des problèmes complexes en mécanique des fluides A. Harnist TEL tel-03518264



— Presentations —

- 04/2023 CMI seminar at Marseille, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
   03/2023 EMA seminar at LMPA, Université du Littoral Côte d'Opale, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
- 03/2023 **LMAC seminar** at Compiègne, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
- 02/2023 **Applied mathematics seminar** at LMJL, Nantes, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
- 02/2023 **ANCS seminar** at LmB, Besançon, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems

- 02/2023 **PDE and scientific computing working group** at LMRS, Rouen, France Title *Robust a posteriori estimates of energy differences for nonlinear elliptic problems*
- 02/2023 **DMATHS seminar** at CERAMATHS, Université Polytechnique Hauts-de-France, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
- 02/2023 **Numerical Analysis seminar** at IRMAR, Rennes, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
- 12/2022 **POEMS 2022 Conference** at Politecnico di Milano, Italy Title Hybrid High-Order methods for complex problems in fluid mechanics
- 11/2022 **A3 seminar** at LAMFA, University of Picardie Jules Verne, Amiens, France Title Robust a posteriori estimates of energy differences for nonlinear elliptic problems
- 09/2022 **9th GACM Colloquium 2022** at University of Duisburg-Essen, Germany Title Hybrid High-Order methods for complex problems in fluid mechanics
- 10/2021 **ACSIOM seminar** at IMAG, University of Montpellier, France Title Hybrid High-Order methods for complex problems in fluid mechanics
- 09/2021 **18th European Finite Element Fair** at Inria Paris, France Title *A HHO method for non-Newtonian fluids with power-like convective behaviour*
- 07/2021 **6th ECCOMAS Young Investigators Conference** at Valencia, Spain Online Title Improved error estimates for Hybrid High-Order discretizations of Leray-Lions problems
- 04/2021 **SERENA seminar** at Inria Paris, France Online Title Improved error estimates for Hybrid High-Order discretizations of Leray-Lions problems
- 02/2021 **ANZIAM Annual Conference 2021** at Melbourne, Australia Online Title Improved error estimates for Hybrid High-Order discretizations of Leray-Lions problems
- 01/2021 **Eccomas Congress 2020 & 14th WCCM** at Paris, France Online Title *A HHO method for creeping flows of non-Newtonian fluids*
- 09/2020 **Conference on Scientific Computing Algoritmy 2020** at Podbanske, Slovakia Online Title *A HHO method for creeping flows of non-Newtonian fluids*
- 03/2020 **Ph.D. students day** at IMAG, Montpellier, France Title *A HHO method for creeping flows of non-Newtonian fluids*

#### — Scientific posters —

- 09/2022 **9th GACM Colloquium 2022** at University of Duisburg-Essen, Germany Title Hybrid High-Order methods for complex problems in fluid mechanics
- 07/2019 **Doctiss 2019 day** at I2S, Montpellier, France Title *A HHO method for creeping flows of non-Newtonian fluids*
- 05/2019 **POEMs 2019 Conference** at CIRM, Marseille, France Title *A HHO method for creeping flows of non-Newtonian fluids*



- 2022 2023 Organizer of a Mini-Symposium for the ICOSAHOM conference at Seoul, Korea Titre Recent developments in polytopal discretization methods Dates 14/08/2023 - 18/08/2023
- 2021 2022 **Reviewer of scientific journals** Journal Numerical Algorithms
- 2021 2022 Organizer of a Mini-Symposium for the WCCM XV – APCOM VIII Congress at Yokohama, Japan Title Recent Advances on Polytopal Methods Date 31 July – 5 Aug. 2022

Organizer of a Workshop at Inria of Paris, France Title Interplay of discretization and algebraic solvers: a posteriori error estimates and adaptivity Date 08/06/2022 - 10/06/2022

Representative of I2S Mathematics–Biostatistics Ph.D. students at I2S, Montpellier, France 2019 - 2021 Objectives Improving the quality of life and integration of Ph.D. students, organizing individual monitoring committees, discussing the courses offered in the I2S catalog

# — Distinctions —

- Qualification for the functions of Assistant Professor, France 02/2022 Section 26 – Applied Mathematics and Applications of Mathematics
- Ranked 1st in the scientific poster competition of Doctiss Day at I2S, Montpellier, France 07/2019
- 06/2018 Ranked 1st in the I2S Mathematics doctoral competition at Montpellier, France

### — Programming skills — — Language skills —

Python	Matlab	HTML
C++	Scilab	CSS
FreeFem++	Julia	PHP
Java	ParaView	JavaScrip
Fortran	Gnuplot	LaTeX

French Native **English** Fluent

Updated on 07/11/2023