CURRICULUM VITAE

January 7, 2025

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Assistant Professor
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Personal Information

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Research Interests

- Numerical analysis of PDEs, scientific computing, finite element methods, non-conforming approximation.
- Navier–Stokes equations, Maxwell equations, the coupling of free flow and flow in porous media.

Education

- **Texas A&M.** College Station, Texas, USA.
  PhD in Applied Mathematics. *Aug. 2010 - May 2016*
  - Advisor : Prof. Jean-Luc Guermond.
  - Thesis title: *'Solving the MHD equations in the presence of non-axisymmetric conductors using the Fourier-finite element method'.* `https://oaktrust.library.tamu.edu/handle/1969.1/156971`
- **IPN-Mexico.** Mexico City, Mexico.
  Bachelor in Applied Mathematics. *Aug. 2000 - Aug. 2005*

Professional Experience

- **Assistant Professor.** Mexico City, Mexico.
  May 2022 - ***Present***
  - Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas (IIMAS).
  - Universidad Autónoma de México (UNAM).
- **INRIA Postdoc-Fellow.** Nice, France.
  Nov. 2019 - April 2022
  - Member of the INRIA Team Coffee.
    Laboratoire de Mathématiques J. A. Dieudonné. Université Côte d'Azur.
  - Supervisor: Prof. Roland Masson.
  - Research on advanced thermal well modelling for the high performance simulation of geothermal systems.
  - Industrial Partners: BRGM and Storengy.
- **CNRS Postdoc-Fellow.** Montpellier, France.
  Nov. 2017 - Oct. 2019

- Institut Montpelliérain Alexander Grothendieck (IMAG), Université de Montpellier.
- Supervisor: Prof. Daniele A. Di Pietro.
- Research on Hybrid-High Order methods (HHO) for the Navier-Stokes eqs.
- Industrial Partners: EDF-R&D.

- **Postdoc-Fellow.** Bilbao, Spain.
  Aug. 2016 - Aug. 2017
  - Basque Center for Applied Mathematics (BCAM).
  - Supervisor: Johan Jansson.
  - Research on multiphase flow and finite element adaptivity.

- **Software Developer.** Mexico City, Mexico.
  Aug. 2007 - Aug. 2010
  - Insys IT, Incorporated.
  - Developed software tools for computer security such as TCP/IP servers, and clients using C++ and Java.

- **Engineer and Research Assistant.** Mexico City, Mexico.
  Aug. 2005 - Aug. 2007
  - ICAT–UNAM.
  - Developed tools for the simulation of chemical systems using finite elements.

Publications

1. D. Castanon Quiroz, and D. A. Di Pietro, **A Reynolds-semi-robust and pressure robust Hybrid High-Order method for the time dependent incompressible Navier–Stokes equations on general meshes.** Computer Methods in Applied Mechanics and Engineering. Vol. 436. March 2025. `https://doi.org/10.1016/j.cma.2024.117660`, arXiv-Preprint: `https://arxiv.org/abs/2409.07037`

2. A. Armandine Les Landes, L. Beaude, D. Castanon Quiroz, L. Jeannin, S. Lopez, F. Smai, T. Guillon, and R. Masson, **Geothermal Modeling in Complex Geological Systems with ComPASS.** Computer & Geosciences. Vol. 194, January 2025. `https://doi.org/10.1016/j.cageo.2024.105752`, `https://brgm.hal.science/hal-04246471`

3. A. Armandine Les Landes, D. Castanon Quiroz, L. Jeannin, S. Lopez, and R. Masson, **Two-phase geothermal model with fracture network and multi-branch wells.** SMAI Journal of Computational Mathematics. Volume 9, 2023. `https://doi.org/10.5802/smai-jcm.97`, `https://hal.archives-ouvertes.fr/hal-03273589`

4. D. Castanon Quiroz and D. A. Di Pietro, **A pressure-robust HHO method for the solution of the incompressible Navier–Stokes equations on general meshes.** *IMA Journal of Numerical Analysis*, published online in April, 2023. `https://doi.org/10.1093/imanum/drad007`, `https://hal.archives-ouvertes.fr/hal-03608248`

5. D. A. Di Pietro, D. Castanon Quiroz and A. Harnist, **A Hybrid High-Order method for incompressible flows of non-Newtonian fluids with power-like convective behaviour.** IMA Journal of Numerical Analysis, December, 2021. `https://doi.org/10.1093/imanum/drab087`, `https://hal.archives-ouvertes.fr/hal-03273118`

6. M. Botti, D. Castanon Quiroz, D. A. Di Pietro, and A. Harnist, **A Hybrid High-Order method for creeping flows of non-Newtonian fluids**. ESAIM: Math. Model Numer. Anal., Volume 55, Number 5, September-October 202, 2021. https://hal.archives-ouvertes.fr/hal-02519233

7. D. Castanon Quiroz and D. A. Di Pietro, **A Hybrid High-Order method for the incompressible Navier–Stokes problem robust for large irrotational body forces**. Comput. Math. Appl., 2020. Vol 79, Issue 9. https://doi.org/10.1016/j.camwa.2019.12.005, https://hal.archives-ouvertes.fr/hal-02151236

8. C. Nore, D. Castanon Quiroz, L. Cappanera and J.-L. Guermond, **Numerical simulation of the Von-Kármán-Sodium experiment**. J. Fluid Mech., 854 (2018) 10 November 2018, 164–195. https://doi.org/10.1017/jfm.2018.582

9. C.E. Janson, A. Shiri, J. Jansson, M. Moragues, D. Castanon, L. Saavedra, C. Degirmenci and M. Leoni, **Nonlinear Computations of Heave Motions for a Generic Wave Energy Converter**. Proceedings of NAV 2018: 19th International Conference on Ship and Maritime Research, 2018, 283–290. http://ebooks.iospress.nl/publication/49237, https://bird.bcamath.org/handle/20.500.11824/901

10. C. Nore, D. Castanon Quiroz, L. Cappanera and J.-L. Guermond, **Direct numerical simulation of the axial dipolar dynamo in the Von Kármán Sodium experiment**. EPL (Europhysics Letters), Volume 114, Number 6, July 2016. https://doi.org/10.1209/0295-5075/114/65002

11. C. Nore, D. Castanon Quiroz, J.-L. Guermond, J. Léorat and F. Luddens, **Numerical Dynamo Action in Cylindrical Containers**, The European Physical Journal Applied Physics (2015) 70:31101. http://dx.doi.org/9.1051/epjap/2015150049

Submitted Articles

1. D. Castanon Quiroz, L. Jeannin, S. Lopez, and R. Masson, **Multi-segmented non-isothermal compositional liquid gas well model for geothermal processes.** *Submitted*, 2024. HAL-Preprint: https://hal.science/hal-04362558

Funding

- From 2023-01 to 2024-12, Grant DGAPA-UNAM (Mexico City, Mexico, MX). Grant Number: DGAPA-IA101723. Total of funding: $ 182,000.00 MXN.

Work as Referee for Journals

- Electronic Research Archive (ERA), IMA Journal of Numerical Analysis (IMAJNA), Computers and Mathematics with Applications (CAMWA), Computer Methods in Applied Mechanics and Engineering (CMAME), Numerical Algorithms, Mathematics in Engineering (MinE), Boletín de la Sociedad Matemática Mexicana.

Thesis Supervision

- PhD thesis:
  - Genner Pineda Ceballos. 2025–Present. Tentative thesis title: *Fractional Partial Differential Equations and Applications to Viscoelastic Materials*. PhD in Mathematics. IIMAS-UNAM, Mexico city, Mexico. Co-supervising with Prof. Luis Lopez Ríos.
- Master thesis:
  - Co-mentoring the student Hind Bouyri in her master thesis at IMAG (University of Montpellier, France) with title: *Implementation of Hybrid High-Order methods for convective terms in Code-Saturne*. Thesis supervisor: Prof. Daniele A. Di Pietro.

- Bachelor thesis:
  - Axel Vladimir Pérez Martínez. 2024–Present. Tentative thesis title: *Solución Numérica de Ecuaciones Diferenciales Parciales Parabólicas por Elementos Finitos y Aplicacion al Análisis Numérico de Metaestabilidad de la Ecuación de Allen-Chan"*. Bachelor in Mathematics. Facultad de Ciencias. UNAM-CU, Mexico City.

Participation in Conferences and Invited Seminars

- Mathematical Trends in Operator Theory, PDE and Mathematical Physics. Invited speaker. IIMAS-UNAM, Mexico City, Mexico. July 22nd-26th, 2024.
- The ERC NEMESIS kick-off workshop, invited keynote speaker. Montpellier, France. June 19th-21st, 2024.
- Seventh Chilean Workshop on Numerical Analysis of Partial Differential Equations (WONAPDE) 2024, invited speaker in the minisymposium named *Recent Advances in Polytopic Methods*, Concepción, Chile. January 18th, 2024.
- Seventh Chilean Workshop on Numerical Analysis of Partial Differential Equations (WONAPDE) 2024, invited speaker in the minisymposium named *Recent Advances in (Hybridizable) Discontinuous Galerkin Methods and Applications*, Concepción, Chile. January 16th, 2024.
- SIAM Mexico Annual Meeting, invited speaker in the minisymposium named *Ecuaciones Diferenciales Parciales no Lineales: Análisis, Numérico y Aplicaciones*, Mexico City, Mexico. June 7th- June 9th, 2023.
- 22nd Conference in Computational Fluid Dynamics, invited speaker in the minisymposium named *Recent advancements in Polytopal Methods for Fluid Mechanics*, Cannes, France. April 25th-28th, 2023.
- 10° Congreso Metropolitano de Modelado y Simulación Numérica, invited speaker, Mexico City, Mexico. April 19, 2023.
- Workshop on Polytopal Element Methods in Mathematics and Engineering (POEMS), Politecnico de Milano, Milan, Italy. December 12nd-14th, 2022.
- Coloquio de Matemáticas y Mecánica del IIMAS, UNAM, Mexico City, Mexico. March 9th, 2022.
- MexSIAM Annual Meeting, mini-symposium "Modelación matemática de flujo y transporte en medios porosos", Mexico City, Mexico. June 21st-23rd, 2021.
- Séminaire de l'équipe EDP Analyse Numérique, Laboratoire J. A. Dieudonné, Nice, France, May 20th, 2021.
- Séminaire Approx, EDP et Modèles aléatoires, LMPA, Université de Littoral, France. April 22nd, 2021.
- ALGORITMY 2020, mini-session "Pressure-robust discretisations for flow problems and their applications", 10th-15th September, Podbanské, Slovakia, 2020.
- MAFELAP 2019, mini-symposium "Theoretical and computational advances in polygonal and polyhedral methods", 18th–21st June 2019, London, England.
- POEMs 2019, session d'affichage, 29th April–3rd May 2019, Marseille, France.
- Colloquium, CIMAT, 13th December 2019, Guanajuato, Mexico.
- Colloquium, Instituto de Matemáticas, 11th December 2019, Querétaro, Mexico.
- CEDYA 2017, mini-symposium "Tecnología matemática como herramienta clave para la Industria 4.0: algunos casos de éxito", 26th–30th June 2017, Cartagena, Spain.
- COUPLED PROBLEMS 2017, 12th–14th June, 2017, Rhodes, Greece.
- 5to Congreso Metropolitano de Modelado y Simulación Numérica 2017, Mexico City, Mexico.

- Colloquium, Instituto de Matemáticas, 13th May 2019, Querétaro, Mexico.
- Colloquium, CIMAT, 12th May 2017, Guanajuato, Mexico.
- Finite Element Rodeo 2016, 4th–5th May 2016, Texas A&M, Texas, USA.
- Finite Element Rodeo 2015, 27th–28th February 2015, Southern Methodist University, Texas, USA.
- Finite Element Rodeo 2014, 28th February–1st March 2014, UT Austin, Texas, USA.

Research Visits

- Visit to IMAG at the University of Montpellier, Montpellier, France. November 25th-December 6th 2024.
- Visit to IMAG at the University of Montpellier, Montpellier, France. May 16th-June 22nd 2024.
- Visit to LJAD at the Université Côte d'Azur, Nice, France. May 2nd-May 5th 2023.
- Visit to LIMSI at the University of Orsay-Paris, France. Under grant NSF-500401-00001. Summer 2012.

Teaching Experience

- Fourier Analysis I (in Spanish). Undergraduate level course. Fall 2025. Facultad de Ciencias, UNAM, Mexico City, Mexico.
- Numerical Analysis of Ordinary Differential Equations (in Spanish). Graduate level course. Spring 2024. IIMAS-UNAM, Mexico City, Mexico.
- Introduction to Finite Elements: Practice and Applications (in Spanish). Bachelor level course. Fall 2024. Facultad de Ciencias, UNAM, Mexico City, Mexico.
- Theory, Practice and Applications of Finite Elements (in Spanish). Graduate course. Spring 2023. Posgrado en Matemáticas, IIMAS-UNAM, Mexico City, Mexico.
- Numerical Methods for Ordinary Differential Equations (in Spanish). Undergraduate course at the 3rd year. Fall 2022. UNAM, Facultad de Ciencias, Mexico City, Mexico.
- Differential Calculus and Dynamical Systems (in French). Python Labs. Undergraduate level 2nd year. Fall 2021. University Côte d'Azur, Nice, France.
- Math 610: (Master-graduate class) Numerical Methods for PDEs. Recitation and Labs (Matlab). Fall 2013. Texas A&M, USA.
- Math 151: Engineering Mathematics I. Recitation and Labs (Matlab). Fall 2011. Texas A&M, USA.
- Math 141/142: Business Mathematics I & II. Help Sessions. Summer 2011. Texas A&M, USA.
- Math 442: Mathematical Modeling. Grader. Spring 2011. Texas A&M, USA.
- Math 411: Mathematical Probability. Grader. Fall 2010. Texas A&M, USA.

Skills

Spoken Languages: Spanish (native), English (fluent), French (level B1).

Programming Languages: C/C++, Fortran90, Python3, MPI, Unix-Bash.