Jordi Vila-Pérez

Massachusetts Institute of Technology
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Research Interests

Numerical methods, discontinuous Galerkin, finite volumes.
Fluid mechanics, space weather, aerodynamics, compressible flow.

Experience

Massachusetts Institute of Technology (MIT) 2021-present
Postdoctoral associate (with: Prof. J. Peraire, Dr. N.-C. Nguyen)
Dept. of Aeronautics and Astronautics, Aerospace Computational Design Laboratory

Education

PhD in Applied Mathematics 2021
Universitat Politècnica de Catalunya (UPC), Barcelona.
Barcelona Graduate School of Mathematics (BGSMath).
Thesis: Low and high-order hybridised methods for compressible flows.
Advisors: Prof. A. Huerta, Dr. M. Giacomini, Prof. R. Sevilla.

MSc in Advanced Mathematics and Mathematical Engineering 2017
Universitat Politècnica de Catalunya (UPC), Barcelona.
Master thesis: HDG method for incompressible flows.

Double degree in Aerospace Engineering and Mathematics 2016
CFIS (Interdisciplinary Centre of Higher Education), UPC, Barcelona.

Articles and Preprints

[6] A high-order discontinuous Galerkin approach for physics-based thermospheric modeling. *(Submitted)*, (2023).
J. Vila-Pérez, N.-C. Nguyen, J. Peraire.

[5] An adaptive viscosity regularization approach for the numerical solution of conservation laws: Application to finite element methods. *J. Comput. Phys. (Accepted)*, (2023).
N.-C. Nguyen, J. Vila-Pérez, J. Peraire.

[4] Benchmarking the face-centred finite volume method for compressible laminar flows. *Inter. J. of Numerical Methods for Heat & Fluid Flow*, 33 (6), 2198-2231 (2023).
J. Vila-Pérez, M. Giacomini, A. Huerta.

[3] Exasim: Generating discontinuous Galerkin codes for numerical solutions of partial differential equations on graphics processors. *SoftwareX*, 20, 101212 (2022).
J. Vila-Pérez, R. L. Van Heyningen, N.-C. Nguyen, J. Peraire.

[2] A non-oscillatory face-centred finite volume method for compressible flows. *Computers & Fluids*, 235, 105272 (2022).
J. Vila-Pérez, M. Giacomini, R. Sevilla, A. Huerta.

[1] Hybridisable discontinuous Galerkin formulation of the compressible flows. *Arch. Comput. Methods Eng.*, 28, 753–784 (2021).
J. Vila-Pérez, M. Giacomini, R. Sevilla, A. Huerta.

Conference Talks

- 2023 European Space Weather Week, Toulouse (accepted) November 2023
An open-source framework for high-fidelity physics-based space weather modeling on GPU systems: validation and benchmarks.
- 2023 AIAA Scitech Forum, National Harbor (MD) January 2023
High-fidelity DG method for physics-based space weather modeling. [Paper]

- 15th WCCM-APCOM, Yokohama — August 2022
  A high-fidelity physics-based approach for space weather modeling.
- AGU 2021 Fall Meeting, New Orleans — December 2021
  A high-order discontinuous Galerkin method for space weather modeling.
- 14th WCCM-ECCOMAS, Paris — January 2021
  HLL-type Riemann solvers for hybridisable discontinuous Galerkin.
- 13th NMASE Workshop, Castelldefels — January 2018
  A face-centred finite volume method for the Euler equations.

Posters

- 2023 SWQU Spring Meeting, Boston — March 2023
  A High-Order discontinuous Galerkin Method for Physics-Based Thermospheric Modeling.
- AGU 2022 Fall Meeting, Chicago — December 2022
  A High-Fidelity Approach for Physics-Based Modeling of the Ionosphere-Thermosphere System.

Seminar Talks

- LaCàN Seminar, UPC, Barcelona — June 2019
  Riemann solvers in hybridised discontinuous Galerkin methods for compressible flows.
- LaCàN Seminar, UPC, Barcelona — May 2018
  A global view on Riemann solvers.

Teaching Experience

Teaching Assistant, MIT

- Numerical Methods for Partial Differential Equations, 16.920 — Fall 2023
  Course Instructor, University of Colorado, Boulder
- Space Weather Simulation Summer School — Summer 2022

Projects and Funding

Co-I for the **MIT Portugal Program, Seed Grant**, 2023-2024 (PI: J. Peraire).
Awarded amount: $100,000.

Grants and Awards

BGSMath doctoral fellowship through María de Maeztu excellence program.
3 years (2017-2020) competitive fellowship in Spanish Excellence Centre of Research.
Ministry of Economy, Industry, and Competitiveness, Government of Spain.

Youth Research Award, Government of Catalonia, 2011.

Baccalaureate National Award, Government of Spain, 2011.

Baccalaureate Extraordinary Award, Government of Catalonia, 2011.

Research Visits

Zienkiewicz Centre for Computational Engineering, Swansea University, UK. — 2019 (February-May)
Funded through: UPC Doctoral Erasmus+ scholarship.

Cardiovascular Fluid Mechanics Laboratory, Georgia Institute of Technology, Atlanta, USA. — 2016 (February-July)
Funded through: CFIS excellence international mobility grant.
MOBINT international mobility grant, Government of Catalonia.

Participation at Courses

- Summer School on Efficient High-Order Discretizations for Computational Fluid Dynamics, CISM-ECCOMAS, Udine, 2018.
- Summer School on Discontinuous Galerkin Methods, UPC, Barcelona, 2017.

- Winter school Recent Trends in Nonlinear Science, DANCE, Vigo, 2017.

Science Programmes

Research Science Institute (RSI), Centre for Excellence in Education, Massachusetts Institute of Technology, Boston, 2010.

Youth and Science Program (*Programa Joves i Ciència*), Obra Social Caixa Catalunya, Barcelona, 2009-2011.

Estalmat Project, Catalan Society of Mathematics, Barcelona, 2005-2007.

Others

- Fellow of WhatIf, scientific educational project. 2015-2017
- Delegate of MAGMA, Association to Promote Youth Research. 2014-2016
- Organizing committee of the science fair Exporecerca Jove, Barcelona. 2014-2016
- Candidates selector at the 8th edition of the Youth and Science Program, Fundació Catalunya-La Pedrera. 2015

Boston, September, 2023.