

Hugo Casquero

PERSONAL AND CONTACT INFORMATION

PLACE AND DATE OF BIRTH: Spain | 06/25/1989
ADDRESS: 4901 Evergreen Rd., Dearborn, MI, 48128, USA
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RESEARCH INTERESTS

Computational Mechanics; Fluid Mechanics; Structural Analysis; Isogeometric Analysis; Seamless Integration of CAD and FEA; Crash simulations; NVH; Structure-Preserving Discretizations; Magnetohydrodynamics; Fluid-Structure Interaction; Biomechanics; Cell-Scale Blood Flow; Large-Scale Computing;

EDUCATION

SEPT. 2012 - SEPT. 2016 Ph.D., Civil Engineering at University of A Coruña, Spain.
Thesis: “An immersed methodology for fluid-structure interaction using NURBS and T-splines: Theory, algorithms, validation, and application to blood flow at small scales.”
Advisor: Prof. Hector Gomez.
Summa Cum Laude.
International Doctor.

SEPT. 2007 - JULY 2012 Coupled B.S. and M. S., Civil Engineering at University of A Coruña, Spain.
Among the top 5% GPAs of the 2012 graduating class.

RESEARCH EXPERIENCE

SEPT. 2020 - CURRENT Assistant Professor at UNIVERSITY OF MICHIGAN - DEARBORN, USA.

APR. 2017 - AUG. 2020 Postdoctoral Researcher at CARNEGIE MELLON UNIVERSITY, USA.
Supported by (1) the National Science Foundation through the CAREER Award OCI-1149591 and (2) Honda Motor Company.
Advisor: Prof. Yongjie Jessica Zhang.

OCT. 2016 - MAR. 2017 Postdoctoral Researcher at UNIVERSITY OF A CORUÑA, Spain.
Supported by the European Research Council through the FP7 Ideas Starting Grant #30720.
Advisor: Prof. Hector Gomez.

DEC. 2012 - SEPT. 2016 Predoctoral Researcher at UNIVERSITY OF A CORUÑA, Spain.
Supported by the European Research Council through the FP7 Ideas Starting Grant #30720.
Advisor: Prof. Hector Gomez.

TEACHING EXPERIENCE

5. “Finite Element Methods” (ME 510) at University of Michigan - Dearborn. Winter 2021. Winter 2022. Average instructor rating: 4.57/5.0.
4. “The Finite Element Method with Applications” (ME 410) at University of Michigan - Dearborn. Winter 2021. Average instructor rating: 4.50/5.0.
3. “Computational Thermo-Fluids” (ME 525) at University of Michigan - Dearborn. Fall 2021. Average instructor rating: 4.75/5.0.
2. “Computational Thermo-Fluids” (ME 4301) at University of Michigan - Dearborn. Fall 2021. Average instructor rating: 4.45/5.0.
1. “Introduction to Scientific Computing” (24-281) at Carnegie Mellon University. Fall 2018. Spring 2019. Average instructor rating: 4.02/5.0.

REFEREED JOURNAL ARTICLES

11. X. Wei, X. Li, K. Qian, T. J. R. Hughes, Y. J. Zhang, **H. Casquero**, “Analysis-suitable unstructured T-splines: Multiple extraordinary points per face”, *Computer Methods in Applied Mechanics and Engineering*, 2022, 391, 114494.
10. **H. Casquero**, C. Bona-Casas, D. Toshniwal, T.J.R. Hughes, H. Gomez, Y.J. Zhang, “The divergence-conforming immersed boundary method: Application to vesicle and capsule dynamics”, *Journal of Computational Physics*, 2021, 425, 109872.
9. **H. Casquero**, X. Wei, D. Toshniwal, A. Li, T.J.R. Hughes, J. Kiendl, Y.J. Zhang, “Seamless integration of design and Kirchhoff-Love shell analysis using analysis-suitable unstructured T-splines”, *Computer Methods in Applied Mechanics and Engineering*, 2020, 360, 112765.
8. **H. Casquero**, Y.J. Zhang, C. Bona-Casas, L. Dalcin, H. Gomez, “Non-body-fitted fluid-structure interaction: Divergence-conforming B-splines, fully-implicit dynamics, and variational formulation”, *Journal of Computational Physics*, 2018, 374, 625-653.
7. J. Bueno, **H. Casquero**, Y. Bazilevs, H. Gomez, “Three-dimensional dynamic simulation of elastocapillarity”, *Meccanica*, 2018, 53, 1221-1237.
6. **H. Casquero**, C. Bona-Casas, H. Gomez, “NURBS-based numerical proxies for red blood cells and circulating tumor cells in microscale blood flow”, *Computer Methods in Applied Mechanics and Engineering*, 2017, 316, 646-667.
5. **H. Casquero**, L. Liu, Y.J. Zhang, A. Reali, J. Kiendl, H. Gomez, “Arbitrary-degree T-splines for isogeometric analysis of fully nonlinear Kirchhoff-Love shells”, *Computer-Aided Design*, 2017, 82, 140-153.
4. L. Liu, **H. Casquero**, H. Gomez, Y.J. Zhang, “Hybrid-degree weighted T-splines and their application in isogeometric analysis”, *Computers & Fluids*, 2016, 141, 42-53.
3. **H. Casquero**, L. Liu, C. Bona-Casas, Y.J. Zhang, H. Gomez, “A hybrid variational-collocation immersed method for fluid-structure interaction using unstructured T-splines”, *International Journal for Numerical Methods in Engineering*, 2016, 105, 855-880.

2. **H. Casquero**, L. Liu, Y.J. Zhang, A. Reali, H. Gomez, “Isogeometric collocation using analysis-suitable T-splines of arbitrary degree”, *Computer Methods in Applied Mechanics and Engineering*, 2016, 301, 164-186.
1. **H. Casquero**, C. Bona-Casas, H. Gomez, “A NURBS-based immersed methodology for fluid-structure interaction”, *Computer Methods in Applied Mechanics and Engineering*, 2015, 284, 943-970.

PREPRINTS

3. Z. Wen, M.S. Faruque, X. Wei, **H. Casquero**, “Isogeometric analysis using G-splines”, in preparation.
2. M. Golestanian, **H. Casquero**, “Extending ANSC1C0 elements to remove shear and membrane locking from NURBS-based discretizations of linear plane Timoshenko rods”, in preparation.
1. **H. Casquero**, M. Golestanian, “Removing membrane locking in quadratic NURBS-based discretizations of linear plane Kirchhoff rods: ANSC1C0 elements”, submitted for publication.

RESEARCH GRANTS AND GIFTS RECEIVED

6. “Crashworthiness simulations using thin-walled solid BEXT meshes”, Honda Motor Co., \$70,000, 07/01/2022 - 03/31/2023, PI: H. Casquero.
5. “Ford-UM University Research Program: Benchmarking of splines with extraordinary points for crash simulations”, Ford Motor Co., \$100,000, 05/01/2022 - 4/30/2024, PI: H. Casquero.
4. “Engineering Research Initiation (ERI): Seamless integration between CAD and FEA of thin-walled structures using splines with extraordinary points”, National Science Foundation, \$200,000, 01/01/2022 - 12/31/2023, PI: H. Casquero.
3. “Ford-UM Summer Sabbatical Program”, Ford Motor Co., \$36,742, 05/01/2021 - 06/30/2021.
2. “Seamless Integration between Design and Analysis of Thin-Walled Structures”, Honda Motor Co., \$110,000, 09/01/2020 - 03/31/2022, PI: H. Casquero.
1. “Industrial Applications of Isogeometric Analysis”, Ansys Inc., \$45,000, Fall 2020, Fall 2021, unrestricted gifts to H. Casquero.

SUPERCOMPUTING GRANTS RECEIVED

3. “Isogeometric analysis: Fluid-structure interaction, droplets, neuron transport, and image processing”, Extreme Science and Engineering Discovery Environment (XSEDE), 2,644,953 compute hours; 01/01/2020 - 06/30/2021. (PI: Y.J. Zhang, co-PI: H. Casquero)

2. “Isogeometric analysis: Fluid-structure interaction, droplets, Kirchhoff-Love shells, and image processing”, Extreme Science and Engineering Discovery Environment (XSEDE), 2,324,569 compute hours; 09/30/2018 - 12/31/2019. (PI: Y.J. Zhang, co-PI: H. Casquero)
1. “Divergence-conforming splines: From fluid-structure interaction to two-fluid flows”, Extreme Science and Engineering Discovery Environment (XSEDE), 3,684,074 compute hours; 09/30/2017 - 09/30/2018. (PI: Y.J. Zhang, co-PI: H. Casquero)

AWARDS AND HONORS

- 2017: Runner-up award for the Best Doctoral Thesis Prize in Biomedical Engineering given by the International Journal for Numerical Methods in Biomedical Engineering.
- 2017: Travel Award given by 14th U.S. National Congress on Computational Mechanics.
- 2016: Outstanding PhD Thesis Award, Civil Engineering Doctoral Program, Universidade da Coruña, Spain.
- 2014: Travel Award given by 11th World Congress on Computational Mechanics.

CONFERENCES

20. (20-min Invited talk) X. Wei, X. Li, K. Qian, T.J.R. Hughes, Y.J. Zhang, H. Casquero, “Extending the subset of analysis-suitable T-splines: Multiple extraordinary points per face”, *16th U.S. National Congress on Computational Mechanics*, Chicago, Illinois (USA), July 25-29, 2021.
19. (40-min Keynote talk) H. Casquero, X. Wei, D. Toshniwal, A. Li, T.J.R. Hughes, J. Kiendl, Y.J. Zhang, “Bridging the gap between the design of smooth surfaces with arbitrary topology and Kirchhoff-Love shell analysis”, *15th U.S. National Congress on Computational Mechanics*, Austin, Texas (USA), July 28 - August 1, 2019.
18. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “About imposing the incompressibility constraint at both the Eulerian and Lagrangian Levels in immersed boundary methods”, *VIII International Conference on Coupled Problems in Science and Engineering*, Sitges, Spain, June 3 - June 5, 2019.
17. (45-min Invited talk) H. Casquero, “The divergence-conforming immersed boundary method”, *Structure preserving discretizations: FEM, Splines, and IGA*, Pittsburgh, Pennsylvania (USA), May 31 - June 1, 2019.
16. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “The divergence-conforming immersed boundary method: Solids of codimension zero and one”, *20th International Conference on Fluid Flow Problems*, Chicago, Illinois (USA), March 31 - April 3, 2019.
15. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “The divergence-conforming immersed boundary method”, *13th World Congress on Computational Mechanics*, New York City, New York (USA), September 22-27, 2018.

14. (20-min Contributed talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “The divergence-conforming immersed boundary method”, *2018 Annual Meeting of the Society for Industrial and Applied Mathematics*, Portland, Oregon (USA), July 9-13, 2018.
13. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “Divergence-conforming and fully-implicit simulation of microscale blood flow”, *International Conference on Isogeometric Analysis*, Pavia, Italy, September 11-13, 2017.
12. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “Divergence-conforming and fully-implicit simulation of cell-scale blood flow”, *14th U.S. National Congress on Computational Mechanics*, Montreal, Canada, July 17-20, 2017.
11. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “Continuum-based modeling and simulations of biological cells embedded in blood plasma”, *VII International Conference on Coupled Problems in Science and Engineering*, Rhodes, Greece, June 12-14, 2017.
10. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, Y.J. Zhang, “Dynamics and rheology of biological cells in flow”, *5th International Conference on Computational and Mathematical Biomedical Engineering*, Pittsburgh, Pennsylvania (USA), April 10-12, 2017.
9. (20-min Invited talk) H. Casquero, C. Bona-Casas, H. Gomez, “Behavior of red blood cells and circulating tumor cells in shear and parabolic flows”, *Isogeometric Analysis and Meshfree Methods*, La Jolla, California (USA), October 10-12, 2016.
8. (20-min Invited talk) H. Casquero, J. Kiendl, A. Reali, Y. Zhang, H. Gomez, “Analysis-suitable T-splines of arbitrary degree: from isogeometric collocation to fully nonlinear Kirchhoff-Love shells”, *The 19th European Conference on Mathematics for Industry*, Santiago, Spain, January 8-10, 2016.
7. (20-min Contributed talk) H. Casquero, C. Bona-Casas, H. Gomez, “A high-performance immersed methodology for particulate flow problems”, *VII European Congress on Computational Methods in Applied Sciences and Engineering*, Crete, Greece, June 5-10, 2016.
6. (20-min Contributed talk) H. Casquero, C. Bona-Casas, L. Liu, J. Zhang, H. Gomez, “An immersed technique for fluid-structure interaction using NURBS and T-splines: Validation and applications”, *III International Conference on Isogeometric Analysis*, Trondheim, Norway, June 1-3, 2015.
5. (Poster) *CompImage 2014*. Pittsburgh, Pennsylvania (USA), September 3-5, 2014.
4. (20-min Contributed talk) H. Casquero, C. Bona-Casas, H. Gomez, “An immersed methodology for fluid-structure interaction”, *11th World Congress on Computational Mechanics*, Barcelona, Spain, July 20-25, 2014.
3. *Isogeometric Analysis: Integrating Design and Analysis*. Austin, Texas (USA), January 8-10, 2014.
2. *National Congress of the Spanish Oncology Society*. Salamanca, Spain, October 27-30, 2013.

1. *Mathways into Cancer*. Sevilla, Spain, May 27-30, 2013.

PROFESSIONAL ACTIVITIES

17. Symposium co-organizer. “Industrial Applications of IGA” within the X International Conference on Isogeometric Analysis. Banff, Canada, November 6-9, 2022.
16. Scientific Committee Member. X International Conference on Isogeometric Analysis. Banff, Canada, November 6-9, 2022.
15. Symposium co-organizer. “Industrial Applications of IGA” within the 15th World Congress on Computational Mechanics. Yokohama, Japan, July 31 - August 5, 2022.
14. Scientific Committee Member. IX International Conference on Isogeometric Analysis. Lyon, France, September 27-29, 2021.
13. Symposium co-organizer. “Immersed Discretizations in Computational Mechanics: Mathematics, Algorithms, and Applications” within the 16th U.S. National Congress on Computational Mechanics. Chicago, Illinois (USA), July 25-29, 2021.
12. Symposium co-organizer. “Computational Fluid Dynamics (CFD) and Fluid-structure Interaction (FSI): Algorithms and Applications” within the 16th U.S. National Congress on Computational Mechanics. Chicago, Illinois (USA), July 25-29, 2021.
11. Symposium main organizer. “Industrial Applications of IGA” within the 16th U.S. National Congress on Computational Mechanics. Chicago, Illinois (USA), July 25-29, 2021.
10. Executive member of the Technical Trust Area in Computational Fluid Dynamics and Fluid-Structure Interaction at the United States Association of Computational Mechanics.
9. Symposium main organizer and session chair. “Immersed Methods for CFD and Fluid-Structure Interaction” within the 15th U.S. National Congress on Computational Mechanics. Austin, Texas (USA), July 28 - August 1, 2019.
8. Symposium main organizer and session chair. “Immersed Methods for CFD and Fluid-Structure Interaction” within the 20th International Conference on Finite Elements in Flow Problems. Chicago, Illinois (USA), March 31 - April 3, 2019.
7. Scientific Committee Member. VIII International Conference on Coupled Problems in Science and Engineering. Sitges, Spain, June 3-5, 2019.
6. Symposium main organizer and session chair. “Immersed Methods for CFD and Fluid-Structure Interaction” within VIII International Conference on Coupled Problems in Science and Engineering. Sitges, Spain, June 3-5, 2019.
5. Symposium main organizer and session chair. “Immersed Methods for CFD and Fluid-Structure Interaction” within the 13th World Congress on Computational Mechanics. New York City, New York (USA), July 22-27, 2018.
4. Session chair. “Fluid-Structure Interactions” within the 2018 Annual Meeting of the Society for Industrial and Applied Mathematics. Portland, Oregon (USA), July 9-13, 2018.

3. Session chair. “Isogeometric Methods for Coupled Problems on Complex Geometries” within the 14th U.S. National Congress on Computational Mechanics. Montreal, Canada, July 17-20, 2017.
2. Scientific Committee Member. VII International Conference on Coupled Problems in Science and Engineering. Rhodes, Greece, June 12-14, 2017.
1. Symposium co-organizer and session chair. “Isogeometric Methods for Coupled Problems on Complex Geometries” within the VII International Conference on Coupled Problems in Science and Engineering. Rhodes, Greece, June 12-14, 2017.

RESEARCH VISITS

- JULY. 2019 - AUG. 2019 UNIVERSITY OF TEXAS AT AUSTIN, Austin, Texas (USA).
Supervisor at the host university: Prof. Thomas J.R. Hughes.
- MAR. 2015 - APR. 2015 UNIVERSITY OF PAVIA, Pavia, Italy.
Supervisor at the host university: Alessandro Reali.
- SEPT. 2014 - JAN. 2015 CARNEGIE MELLON UNIVERSITY, Pittsburgh, Pennsylvania (USA).
Supervisor at the host university: Yongjie Jessica Zhang.
Predoctoral scholarship given by Inditex-UDC.

PROFESSIONAL JOURNAL REFEREE

Computer Methods in Applied Mechanics and Engineering; Computational Mechanics; International Journal for Numerical Methods in Engineering; Computer-Aided Design; Engineering with Computers; Journal of the Mechanical Behavior of Biomedical Materials; Computers and Fluids; International Journal for Numerical Methods in Biomedical Engineering; Thin-Walled Structures.

ATTENDED INTERNATIONAL COURSES

- JUL. 2016 “Biological and Bio-inspired Fluid Mechanics”.
International Centre for Mechanical Sciences, Udine (Italy).
- JUL. 2014 “Computational Fluid-Structure Interaction”.
Instructors: Yuri Bazilevs, Kenji Takizawa, Tayfun Tezduyar. Barcelona (Spain).
- NOV. 2013 “Advanced Post-Processing of Experimental and Numerical Data”.
Von Karman Institute for Fluid Dynamics, Brussels (Belgium).
- MAY 2013 “Iso-Geometric Methods for Numerical Simulation”.
International Centre for Mechanical Sciences, Udine (Italy).

VOLUNTEER ACTIVITIES

- Member of two diversity-related organizations at Carnegie Mellon University: SafeZone and SALSA.
- Co-organizer of events for foreign visiting students while I was an undergraduate student in Spain.

IDENTIFIERS

- ResearcherID: G-3231-2018.
- ORCID: 0000-0003-4176-4261.
- Scopus Author ID: 56444485900.

CITATION METRICS

Number of Citations: 342 (Google Scholar), 192 (Web of Science)
Metrics h-index: 9 (Google Scholar), 8 (Web of Science)
i10-index: 9 (Google Scholar), 8 (Web of Science)

PROFESSIONAL AFFILIATIONS

United States Association for Computational Mechanics (USACM).
The American Society of Mechanical Engineers (ASME).
The American Physical Society (APS).