Juan David **Navarro**

Postdoctoral Fellow, Department of Mechanical Engineering, The University of Texas at San Antonio

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Education

The University of Texas at San Antonio — *San Antonio, TX, USA*

Ph.D. Mechanical Engineering — *Aug. 2023*

- Sensitivity Analysis in Structural Dynamics Using Hypercomplex Automatic Differentiation and Spectral Finite Elements
- Thesis Advisor: Dr. David Restrepo

Universidad EAFIT — *Medellin, Colombia*

M.Sc. Engineering — *Mar. 2019*

- Computational and Experimental Characterization of Homogeneous Isotropic Turbulence
- Thesis Advisor: Dr. Juan Camilo Isaza

Universidad EAFIT — *Medellin, Colombia*

B.S. Mechanical Engineering — *Dec. 2015*

- Complementary studies in computational mechanics

Skills

FEM Packages	Abaqus, Comsol, FEAP, Calculix
Programming	Fortran, Matlab, Python, Mathematica, VisualBasic
Design	Solidworks, PTC-Creo, Rhinoceros 3D, Autocad
Other software	Microsoft Office, Git, Windows, Linux, Mac OS, Open-MP, Open-MPI, Latex
Control	LabView, Arduino, PLC
Experiments	Design of Experiments, Additive Manufacturing, Universal Testing Machine, Digital Image Correlation (2D & 3D), Vibration Shaker, Lock-In Amplifier, Hot-Wire Anemometer, Laser Doppler Vibrometer, DAQ, Piezoelectric Transducers
Languages	English, Spanish

Work Experience

The University of Texas at San Antonio — *San Antonio, TX, USA*

Postdoctoral Fellow — *Sept. 2023 - Present*

- Design of Novel Architected Materials for Drag Reduction and Flow Control in Hypersonic Vehicles

The University of Texas at San Antonio — *San Antonio, TX, USA*

Graduate Research / Teaching Assistant — *Jan. 2019 - Aug. 2023*

- Graduate Research Assistant at the Advanced Materials and Mechanical Systems Laboratory
- Graduate Teaching Assistant of the Measurements and Instrumentation Course
- Graduate Teaching Assistant of the Engineering Practice and Graphics Course
- Research on Sensitivity Analysis and Uncertainty Quantification of Architected Phononic Metamaterials through the Hypercomplex Finite Element Method
- Sensitivity Enhanced Nondestructive Evaluation computations for Structural Health Monitoring
- Development of a **VUEL** library to implement the Hypercomplex Spectral Finite Element Method in Abaqus/Explicit
- Numerical and Experimental Characterization of a Phononic Metamaterial for hypersonic flow control
- Design & Analysis of Novel Expandable Architected Breathing Tube for Improving Airway Securement in Emergency Care

Aire Verde Ingenieria — *Medellin, Colombia*

HVAC Design Engineer — *Sept. 2018 - Dec. 2018*

- Responsible for the Design of Heating and Air Conditioning Systems
- Leader in the implementation of new technologies towards LEED certification

Universidad EAFIT *Ithaca, NY, USA*

Research Intern at Cornell University *Jun. 2017 - Dec. 2017*

- Experimental characterization of Homogeneous Shear Turbulent Flows through hot-wire anemometer

Universidad EAFIT *Medellin, Colombia*

Graduate Research / Teaching Assistant *Jan. 2016 - Jun. 2017*

- Graduate Teaching Assistant of the Turbulent Flows Course
- Development of a parallel direct numerical simulation code to model 2D Homogeneous Isotropic Turbulence
- Identification of the Lagrangian Coherent Structures

Renault-SOFASA *Envigado, Colombia*

Internal Logistics' Department Engineer Intern *Jan. 2015 - Jul. 2015*

- Leader in the implementation of Lean Manufacturing concepts to the internal logistics flows to the vehicles' welding and assembly lines
- Director of the department's performance metrics
- Responsible for investigating and ensuring quick response at quality controls

Honors & Awards

2023	**Graduate School Professional Development Award,** The University of Texas at San Antonio	*San Antonio, TX, USA*
2022	**Roberto Rocca Doctoral Fellowship,** Tenaris, Ternium, Techint, and Tecpetrol	*Buenos Aires, Argentina*
2018	**Scholarship to pursue Doctoral Studies,** The University of Texas at San Antonio	*San Antonio, TX, USA*
2016	**Scholarship to pursue Master Studies,** Universidad EAFIT	*Medellin, Colombia*

Scientific Publications

In progress	**Navarro, J. D.**, Velasquez-Gonzalez, J. C., , Aristizabal, M., Jarmer, G., Kessler, S., Montoya, A., Millwater, H. R.& Restrepo, D. ***An Efficient Model-Assisted Probability of Detection Framework for Structural Health Monitoring Systems using HYPAD-SFEM-UQ.***
In progress	Velasquez-Gonzalez, J. C., **Navarro, J. D.**, Aristizabal, M., Jarmer, G., Kessler, S., Montoya, A., Millwater, H. R.& Restrepo, D. ***Arbitrary-Order Sensitivity Analysis in Spectral Mindlin-Reissner Shell Elements with the Hypercomplex Step Method.***
In progress	Velasquez-Gonzalez, J. C., **Navarro, J. D.**, & Restrepo, D. ***Parameters Optimization of Broadband Low-frequency Attenuation Phononic Materials using the Hypercomplex Taylor Series Expansion (ZTSE).***
Under Review	**Navarro, J. D.**, Velasquez-Gonzalez, J. C., & Restrepo, D. ***Arbitrary-Order Sensitivity Analysis of Frequency Response Functions Using Hypercomplex Algebras and Spectral Finite Elements Method.*** Journal of Computational Physics
Under Review	**Navarro, J. D.**, Velasquez-Gonzalez, J. C., Aristizabal M., Jarmer, G., Kessler, S., Montoya, A., Millwater, H. R.& Restrepo, D. ***Sensitivity Analysis in Structural Dynamics Using Time-Domain Hypercomplex Spectral Finite Elements.*** AIAA Journal
2023	Velasquez-Gonzalez, J. C., **Navarro, J. D.**, Aristizabal, M., Montoya, A., Millwater, H. R. & Restrepo, D. ***Arbitrary-Order Sensitivity Analysis of Eigenfrequency Problems with Hypercomplex Automatic Differentiation (HYPAD).*** Applied Sciences, 13, 7125. https://doi.org/10.3390/app13127125
2021	**Navarro, J. D.**, Millwater, H. R., Montoya, A. & Restrepo, D. ***Arbitrary-Order Sensitivity Analysis in Phononic Metamaterials Using the Multicomplex Taylor Series Expansion Method Coupled with Bloch's Theorem.*** Journal of Applied Mechanics, pp. 1-43. https://doi.org/10.1115/1.4052830
2021	Berard D., **Navarro, J. D.**, Bascos, G., Harb, A., Feng, Y., De Lorenzo, R., Hood, R. L. & Restrepo, D. ***Novel expandable architected breathing tube for improving airway securement in emergency care.*** Journal of the Mechanical Behavior of Biomedical Materials, 114, 104211. https://doi.org/10.1016/j.jmbbm.2020.104211
2018	**Navarro, J. D.** ***Exponente de escalamiento en turbulencia homogénea isotrópica y cortante.*** Universidad EAFIT. https://repository.eafit.edu.co/handle/10784/15199

Scientific Conferences

Engineering Mechanics Institute Conference (EMI) 2023 *Atlanta, GA, USA*

Presenter of: *Jun. 2023*

Sensitivity Analysis of Model-Assisted Probability of Detection for Guided-Wave-Based Structural Health Monitoring Systems

Author of:

Arbitrary-Order Sensitivity Analysis in the Wave Propagation Behavior of Architected Materials Using HYPAD-FEM

UTSA CAMLS Annual Event and Symposium on Advanced Manufacturing *San Antonio, TX, USA*

Presenter of: *Apr. 2023*

Sensitivity and Uncertainty Quantification in Metamaterials through Complex-Variable Finite Element Method

The Minerals, Metals, and Materials Society 2023 Annual Meeting & Exhibition (TMS 2023) *San Diego, CA, USA*

Author of: *Mar. 2023*

Sensitivity Analysis of Bio-inspired Phononic Materials Using the Hypercomplex Taylor Series Expansion Method

ASME 2022 International Mechanical Engineering Congress and Exposition (IMECE 2022) *Columbus, OH, USA*

Author of: *Nov. 2022*

Understanding and Quantifying the Effect of Imperfections and Uncertainties in the Mechanical Behavior of Architected Materials

Society of Engineering Science Annual Technical Meeting (SES 2022) *College Station, TX, USA*

Presenter of: *Oct. 2022*

Arbitrary-Order Sensitivity Analysis in Wave Propagation Problems Using the Hypercomplex Time-Domain Spectral Finite Element Method (ZSFEM)

Author of:

Sensitivity and Uncertainty Quantification Analysis in Metamaterials Using the Hypercomplex-Variable Finite Element Method

Author of:

Arbitrary-order Sensitivity Analysis of Eigenfrequency Problems Using the Hypercomplex Taylor Series Expansion (ZTSE)

The Minerals, Metals, and Materials Society 2022 Annual Meeting & Exhibition (TMS 2022) *Anaheim, CA, USA*

Presenter of: *Mar. 2022*

Sensitivity and Uncertainty Quantification Analysis in Metamaterials through Complex Variable Finite Element Method

UTSA CAMLS Annual Event and Symposium on Advanced Manufacturing *San Antonio, TX, USA*

Presenter of: *Apr. 2022*

Sensitivity and Uncertainty Quantification in Metamaterials through Complex-Variable Finite Element Method

16th U.S. National Congress on Computational Mechanics (16 USNCCM) *Virtual Event*

Presenter of: *Jul. 2021*

Sensitivity and Uncertainty Quantification Analysis in Metamaterials through Complex Variable Finite Element Method

Engineering Mechanics Institute Conference (EMI) 2021 *Virtual Event*

Presenter of: *May. 2021*

Sensitivity and Uncertainty Quantification Analysis in Metamaterials through Complex Variable Finite Element Method

Virtual Technical Meeting of the Society of Engineering Sciences (SES) 2020 *Virtual Event*

Author of: *Sept. 2020*

Sensitivity and Uncertainty Quantification Analysis in Metamaterials through Complex Variable Finite Element Method

VIII International Congress of Mechanical and Mechatronic Engineerings (CIMM 2017) *Medellin, Colombia*

Presenter of: *Feb. 2017*

Direct Numerical Simulation of Two-Dimensional Turbulence

Professional References

Dr. David Restrepo

Endowed Assistant Professor at The University of Texas at San Antonio

- David.Restrepo@utsa.edu
- (210) 458-7614

Dr. Harry R. Millwater

Samuel G. Dawson Endowed Professor and Associate Chair for Research at The University of Texas at San Antonio

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Dr. Seth S. Kessler

CEO at Metis Design Corporation

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