

Juan Camilo Osorio

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EDUCATION

Aug 2025 **Doctor of Philosophy (PhD.) in Mechanical Engineering, Purdue University, West Lafayette, IN.**

Aug 2019 **Master of Science (MSc.) in Mechanical Engineering, Universidad de los Andes, Bogotá, Colombia.**

Dec 2016 **Bachelor of Science (BSc.) in Mechanical Engineering, Universidad de los Andes, Bogotá, Colombia.**

RESEARCH INTERESTS

My research advances structural nonlinearity and smart structures, with an emphasis on introducing and exploiting nonlinear behavior to achieve new functionalities in engineering systems. By combining fundamental mechanics, computational tools, and bio-inspired design, I harnessed complex nonlinearities to enable robust, efficient, and adaptive performance of different systems.

RESEARCH EXPERIENCE

05/2025–Present **Post-Doctoral Research Associate, Department of Mechanical Engineering, Purdue University**, Being in charge of developing mechanical models for morphing structures and match them to aerodynamic loads..

08/2020–08/2025 **Graduate Research Assistant, Department of Mechanical Engineering, Purdue University**, Design and finite element analysis of bistable elements applied to soft robots; analytical models of multistable structures.

01/2020–06/2020 **Visiting Research Scholar, Purdue University, Herrick Laboratories, Anheuser-Busch InBev partner project**: research in bistable elements produced by plastic deformation of metals; design and numerical analysis for smart packing.

12/2019–11/2020 **Researcher, Universidad de los Andes**, Failure analysis of the Mk82 munition system for Colombia's defense department (INDUMIL); failure prediction based on prestress and aerodynamic loads.

06/2017–08/2019 **Graduate Research Assistant, Universidad de los Andes**, Finite element simulation of machining processes as part of a Colciencias-funded project on ultra-fine grain size design.

TEACHING EXPERIENCE

05/2025–Present **Lecturer, Basic Mechanics course I (Statics), Department of Mechanical Engineering, Purdue University.**

05/2025 **Graduate Teaching Assistant, Bioinspired Materials and Structures - Study abroad, Department of Mechanical Engineering, Purdue University.**

08/2018–06/2019 **Graduate Teaching Assistant, Universidad de los Andes**, Manufacturing Processes and Systems - Teaching different manufacturing processes and CAD tools to Engineering students.

01/2017–06/2017 **Graduate Teaching Assistant, Universidad de los Andes**, Basic Mechanics of Materials - Teaching stress analysis and basic design concepts to sophomore Mechanical Engineering students.

PUBLICATIONS

Journal Articles

Osorio, J.C., Rincon J.S., Morgan H. and Arrieta, A.F., (2025) *Embodying Control in Soft Multistable Robots from Morphofunctional Co-design*. Advanced Science

Karthik Boddapati, **Juan C. Osorio**, Andres F. Arrieta, (2024) On maintaining bistability of prestressed laminates after clamping, Composite Structures

Riley, K.S., Koner, S., **Osorio, J.C.**, Yu, Y., Morgan, H., Udani, J.P., Sarles, S.A. and Arrieta, A.F. (2022), *Neuromorphic Metamaterials for Mechanosensing and Perceptual Associative Learning*. Adv. Intell. Syst.

Abedrabbo, A. F., **Osorio, J. C.**, Abolghasem, S., Valencia, C., Rojas, F. (2020), *Predicting subgrain size and dislocation density in machining-induced surface microstructure of nickel using supervised model-based learning*. Materials Today Communications, 30, 103162

Osorio-Pinzon, J.C., Abolghasem, S., Marañon, A. et al. (2020), *Cutting parameter optimization of Al-6063-O using numerical simulations and particle swarm optimization*. Int. J. Adv. Manuf. Technol. **111**, 2507–2532.

Montenegro, C., Abolghasem, S., **Osorio-Pinzon, J.C.** et al. (2020), *Microstructure prediction in low and high strain deformation of Al6063 using artificial neural network and finite element simulation*. Int. J. Adv. Manuf. Technol. **106**, 2020.

Osorio-Pinzon, J.C., Abolghasem, S. & Casas-Rodriguez, J.P. (2019), *Predicting the Johnson Cook constitutive model constants using temperature rise distribution in plane strain machining*. Int. J. Adv. Manuf. Technol. **105**.

Conference Papers

Morgan, H., **Osorio, J.C.** and Arrieta, A.F. (2023), *Towards open loop control of soft multistable grippers from energy-based modeling*. 2023 IEEE International Conference on Soft Robotics (RoboSoft), Singapore.

Osorio, J.C., Tinsley, C., Tinsley, K. and Arrieta, A.F. (2023), *Manta Ray inspired multistable soft robot*. 2023 IEEE International Conference on Soft Robotics (RoboSoft), Singapore.

Osorio, J.C., Morgan, H. and Arrieta, A.F. (2022), *Programmable Multistable Soft Grippers*. 2022 IEEE 5th International Conference on Soft Robotics (RoboSoft), Edinburgh, United Kingdom.

PATENTS

Applications

11/2025 *Conformable vacuum gripper with series-triggered pneumatic actuators*

11/2025 *Conformable vacuum gripper with parallel-triggered pneumatic actuator array*

Provisional

04/2025 *Interactive surface reconfiguration device and methods of using same*. (PRF Ref.:70976-01)

FELLOWSHIPS, AWARDS, AND HONORS

09/2025 SMASIS Conference Best Student Hardware Competition (1st place), *Curvature Adaptive Robotic End-Effector*

07/2025 Trailblazers in Engineering Fellow

03/2025 APS DSOFT Emerging Soft Matter Excellence Award Finalist

01/2025 2025 Complex Active and Adaptive Material Systems Gordon Research Conference Best Poster Award, *Finite-state mechanologic from geometrical frustration in soft machines*

09/2024 SMASIS Conference Best Student Hardware Competition (3rd place), *Multistable Morphing Surface for Interactive Reconfiguration*

05/2024 Future Leaders in Aerospace Symposium 2024

01/2024 AIAA American Society for Composites Student Paper Award, *On the loss of stability of bistable laminates due to clamping*

01/2024 Bilsland Dissertation Fellowship (2024–2025), Purdue University.

09/2023 SMASIS Division Level Best Paper Award in Mechanics and Material Systems, *Neuromorphic Metamaterials for Mechanosensing and Perceptual Associative Learning*.

09/2023 SMASIS Division Best Paper in Bioinspired Materials and Structures, *Neuromorphic Metamaterials for Mechanosensing and Perceptual Associative Learning*.

03/2022 APS March Meeting DSOFT Division Best Poster Award, *Exploiting Geometrical Frustration in Multistable Soft Robots Part 2: Finite-State Mechanologic*.

ABSTRACTS

Oral Presentations

04/2025 IEEE International Conference on Soft Robotics (ROBOSOFT 2025): *Embodying Control in Soft Multistable Robots from Morphofunctional Co-design*.

03/2025 American Physics Society March Meeting 2025: *Modeling and Design of Non-Abelian Multistable Soft Metastructures*.

05/2024 SIAM 2024 (Invited Talk): *Programmable metastructures from combinatorial stable states*.

05/2024 Future Leaders in Aerospace Symposium 2024: *Embodying mechanical intelligence from mechanical instabilities*.

10/2023 SES Annual Technical Meeting 2023: *Multistable soft gripper with embedded mechanical logic*.

03/2023 American Physics Society March Meeting 2023: *Reduced order modeling of soft hierarchical multistable metasheets with applications*.

10/2022 SES Annual Technical Meeting 2022: *Computing with Multistable Metastructures*.

03/2022 American Physics Society March Meeting 2022: *The Role of Symmetry and Patterning in Hierarchical Multistable Metasheets*.

09/2020 ASME 2020 Conference: *Effect of Boundary Conditions on Multistability of Tape Springs*.

09/2019 XV International Conference on Computational Plasticity (COMPLAS 2019): *Comparison between phenomenological and entropy-based damage models in large strain machining*.

07/2018 13th World Congress on Computational Mechanics (WCCM 2018): *Strain-Rate and Temperature Effects in Ductile Damage and Element Removal Threshold in FEM Orthogonal Cutting Simulations*.

Poster Presentations

01/2025 Complex Active and Adaptive Material Systems Gordon Research Conference *Finite-state mechanologic from geometrical frustration in soft machines*.

01/2025 Complex Active and Adaptive Material Systems Gordon Research Conference *Embodying Control in Soft Multistable Grippers from Morphofunctional Co-design*.

01/2024 Multifunctional Materials and Structures Gordon Research Conference *Computation from geometrical frustration: Metamaterials for tactile sensing and object classification.*

04/2023 IEEE International Conference on Soft Robotics (ROBOSOFT 2023) *anta Ray inspired multistable soft robot.*

04/2023 IEEE International Conference on Soft Robotics (ROBOSOFT 2023) *Towards open loop control of soft multistable grippers from energy-based modeling..*

07/2022 Multifunctional Materials and Structures Gordon Research Conference *Programmable multistable soft grippers with embedded logic.*

04/2022 IEEE International Conference on Soft Robotics (ROBOSOFT 2022) *Programmable multistable soft grippers.*

03/2022 American Physics Society March Meeting 2022 *Exploiting Geometrical Frustration in multistable Soft Robots Part 2: Finite-State Mechanologic.*

PROFESSIONAL SERVICE

2024-2025 Manuscript Reviewer
International Journal of Solids and Structures.
Advanced Materials Technologies.

2024-2025 Official Mechanical Engineering Graduate Association at Purdue (OMEGA).
Treasurer

MENTORING

2024 Mentor, Summer Undergraduate Research Fellowship (SURF), Purdue University
Chelsea Tinsley and Kendal Tinsley, *Manta Ray inspired multistable soft robot*

2022 Mentor, Undergraduate research project, Purdue University
Paul Loughlin, *Flexible Mechanical Sensors*

2019 Mentor, Undergraduate degree project, Universidad de los Andes
Carlos Andres Montenegro, *Finite element modeling of microstructural changes in Al6063-O based on BP neural network*

REFERENCES

Andres F. Arrieta, PhD

Doug and Cathy Field Rising Star Professor, Department of Mechanical Engineering
Purdue University, West Lafayette, IN
Email: arrieta@purdue.edu

Philip Buskohl, PhD

Researcher at United States Air Force Research Laboratory
Wright-Patterson AFB, OH
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Andy Sarles, PhD

James Conklin Fellow and Professor, Department of Mechanical, Aerospace and Biomedical Engineering
University of Tennessee, Knoxville, TN
Email: ssarles@utk.edu