

Exponent® Engineering & Scientific Consulting

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Professional Profile

Dr. Villada specializes in mechanics of materials, experimental testing of materials and products, and finite element analysis (FEA). He combines numerical approaches with laboratory-based research to tackle complex problems involving a wide range of materials, such as those encountered in biomedical devices, flexible electronics, and soft robotics.

With a background in physics and materials engineering, Dr. Villada has experience with experimental testing under various environmental conditions and at different length scales. In addition, he has extensive knowledge of computational mechanics methods to analyze mechanical systems.

Dr. Villada completed his Mechanical Engineering Ph.D. at the University of Colorado in Boulder, specializing in the applications of Shape Memory Polymers (SMPs) and other active materials to flexible electronics and soft robots. He created finite element models to simulate the thermomechanical properties of SMPs. He has applied this expertise to design and manufacture medical and robotic devices, including an in-ear biosensor for sleep stage recognition and a flexible robotic skin for human-machine interaction. While at the University of Colorado, Dr. Villada served as the teaching assistant for the graduate-level Finite Element Analysis class/lab and the Materials and Fluids course.

Before joining Exponent, Dr. Villada performed research and materials engineering consulting at Earable, a start-up that developed a novel device for sleep quality monitoring. He designed the conductive polymer electrode sensor and validated the design through custom mechanical testing and initial clinical trials. He received his bachelor's degree in physics from Brown University, where he was involved with the Large Underground Xenon dark matter detection experiment. There, he carried out cryogenic testing on photomultiplier tubes using custom-made chambers and LED drivers.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, University of Colorado, Boulder, 2020

M.S., Mechanical Engineering, University of Colorado, Boulder, 2017

B.A., Physics, Brown University, 2014

Dean's Outstanding Merit Fellowship, CU Boulder College of Engineering and Applied Sciences, 2015

Colorado Diversity Fellowship, CU Boulder Colorado Diversity Initiative, 2015

Outstanding Mechanical Engineering Research Potential Fellowship, CU Boulder Mechanical Engineering Department, 2015

Prior Experience

Materials Engineer, Earable, Boulder, CO (2018-2020)

Professional Affiliations

American Society of Mechanical Engineers (ASME)

Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)

Publications

Yu Wang, Andres Villada, Yao Zhai, Xiaobo Yin, Jianliang Xiao. "Tunable Surface Wrinkling on Shape Memory Polymers with Applications in Smart Micromirrors." Applied Physics Letters 114, 193701. 10.1063/1.5096767 (2019).

Yu Wang, Yao Zhai, Andres Villada, Sabrina David, Xiaobo Yin, Jianliang Xiao. "Programmable localized wrinkling of thin films on shape memory polymers with application in nonuniform optical gratings." Applied Physics Letters. 112. 251603. 10.1063/1.5037120 (2018).

Presentations

Villada, A. Flexible shape memory polymer in-ear biosensor. International Mechanical Engineering Congress and Exposition (IMECE), Salt Lake City, UT, November 2019 (oral)

Villada, A. Self-folding structures using locally heated shape memory polymers. International Mechanical Engineering Congress and Exposition (IMECE), Salt Lake City, UT, November 2019 (oral)

Villada A. How to find success with a STEM career. Pathways to the Workforce, Materials Research Lab, University of California, Santa Barbara, August 2019 (panel)

Villada A. Towards soft robots and flexible electronics using shape memory polymers. Graduate Engineering Annual Research and Recruitment Symposium, Boulder, CO, February 2019 (oral)

Villada A. Self-folding origami structures using shape memory polymers. Graduate Engineering Annual Research and Recruitment Symposium, Boulder, CO, February 2018 (poster)