

Exponent®
Engineering & Scientific Consulting

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Professional Profile

Dr. Xia specializes in mechanical engineering, with her primary areas of expertise including vibration attenuation, structural dynamics, nonlinear dynamics, wave propagation in complex structures, and structural acoustics. Her breadth of experience enables her to utilize both experimental and theoretical approaches to solve complex engineering problems.

Prior to joining Exponent, Dr. Xia was a postdoctoral fellow at the Georgia Institute of Technology, where she worked on finite element modeling of mammalian cochlea to investigate the rich dynamic responses, improving the understanding of the normal biomechanics of the mammalian ear.

Dr. Xia performed her doctoral work at Georgia Tech's Smart Structures and Dynamical Systems Laboratory (SSDSL) and Vibration and Wave Propagation Lab. Her dissertation was a theoretical and experimental effort centered around leveraging nonlinear attachments and quasiperiodic resonators, respectively, with a focus on vibration attenuation bandwidth enhancement via complex nonlinear dynamics (chaotic vibrations) and topologically non-trivial bandgap formation with localized edge modes. She explored both mechanical and electromechanical (with piezoelectric unit cells) structures to that end, both computationally and via rigorous experiments. She conducted testing with accelerometers, piezoelectric transducers, shakers, and (scanning) laser doppler vibrometer. Other graduate projects included investigating time modulation effects in elastic metamaterials and providing a key role in the experimental validation of the selective wave-filtering feature in an elastic waveguide with time-modulated stiffness. Her graduate work also included courses in acoustics, robotics, mechatronics, transducers and signals, linear and nonlinear control systems.

Academic Credentials & Professional Honors

Ph.D., Mechanical Engineering, Georgia Institute of Technology, 2020

B.S., Mechanical Engineering, Georgia Institute of Technology, 2016

Rising Stars in Mechanical Engineering, 2021

Phononics 2019 National Science Foundation Participation Fellowship

Prior Experience

Postdoctoral Fellow, Georgia Institute of Technology, 2021–2022

Graduate Research Assistant, Georgia Institute of Technology, 2017-2020

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Languages

Mandarin

Publications

Rouleau, M., Craig, S., Xia, Y., Shieh, R., Robinson, M. L., Shi, C., & Meaud, J. (2022). Nonlinear dynamics of a bistable system impacting a sinusoidally vibrating shaker. Nonlinear Dynamics, 1-16.

Farokhi, H., Xia, Y., & Erturk, A. (2022). Experimentally validated geometrically exact model for extreme nonlinear motions of cantilevers. Nonlinear dynamics, 107, 457-475.

Xia, Y., Riva, E., Rosa, M. I., Cazzulani, G., Erturk, A., Braghin, F., & Ruzzene, M. (2021). Experimental observation of temporal pumping in electromechanical waveguides. Physical Review Letters, 126(9), 095501.

Jo, S. H., Xia, Y., Moura, A. G., Yoon, H., Shin, Y. C., Erturk, A., & Youn, B. D. (2021). Experimentally validated broadband self-collimation of elastic waves. International Journal of Mechanical Sciences, 192, 106131.

Xia, Y., Ruzzene, M., & Erturk, A. (2020). Bistable attachments for wideband nonlinear vibration attenuation in a metamaterial beam. Nonlinear Dynamics, 102, 1285-1296.

Xia, Y., Erturk, A., & Ruzzene, M. (2020). Topological edge states in quasiperiodic locally resonant metastructures. Physical Review Applied, 13(1), 014023.

Trainiti, G., Xia, Y., Marconi, J., Cazzulani, G., Erturk, A., & Ruzzene, M. (2019). Time-periodic stiffness modulation in elastic metamaterials for selective wave filtering: Theory and experiment. Physical review letters, 122(12), 124301.

Xia, Y., Ruzzene, M., & Erturk, A. (2019). Dramatic bandwidth enhancement in nonlinear metastructures via bistable attachments. Applied Physics Letters, 114(9), 093501.

Sugino, C., Xia, Y., Leadenham, S., Ruzzene, M., & Erturk, A. (2017). A general theory for bandgap estimation in locally resonant metastructures. Journal of Sound and Vibration, 406, 104-123.

Tol, S., Xia, Y., Ruzzene, M., & Erturk, A. (2017). Self-bending elastic waves and obstacle circumventing in wireless power transfer. Applied Physics Letters, 110(16), 163505.

Presentations

Xia, Y., Samaras, G., Meaud, J. Investigating the Effect of Change in Cochlear Micromechanics and Activity Levels on Stimulus Frequency Otoacoustic Emissions Phase-gradient Delay. Poster presentation, MoH 2022 Mechanics of Hearing Workshop, Helsingr, Denmark, July 2022.

Meaud, J., Wen, H, Samaras, G., Xia, Y. Modeling the fine structure of ear canal pressure and cochlear microphonics in response toa pure tone. Oral presentation, MoH 2022 Mechanics of Hearing Workshop, Helsingr, Denmark, July 2022.

Sugino, C., Xia, Y., Ruzzene, M., and Erturk, A. Elastic Wave Manipulation Using Programmable Piezoelectric Metamaterials. Oral presentation, Proceedings of the 13th ASME Conference on Smart Materials, Adaptive Structures and Intelligent Systems (Virtual), September 2020.

Xia, Y., Ruzzene, M., Erturk, A. Nonlinear Metastructures with Bistable Attachments for Wideband Vibration Attenuation. Oral presentation, SEM IMAC XXXVIII, Houston, TX, February 2020.

Xia, Y., Erturk, A., Ruzzene, M. Non-trivial bandgaps in quasiperiodic locally resonant metastructures. Oral presentation, 56th Annual Technical Meeting of the Society of Engineering Science, St. Louis, MO, October 2019.

Xia, Y., Erturk, A., Ruzzene, M. Non-trivial bandgaps and edge-localized modes in quasiperiodic locally resonant metastructures. Oral presentation, ASME IDETC 2019, Anaheim, CA, August 2019.

Xia, Y., Erturk, A., Ruzzene, M. Topological edge modes in Quasiperiodic locally resonant metastructures. Poster presentation, PHONONICS 2019: 5th International Conference on Phononic Crystals/Metamaterials, Phonon Transport and Topological Phononics, Tucson, Arizona, June 2019.

Xia, Y., Ruzzene, M., Erturk, A. Amplitude-dependent broadband vibration attenuation via bistable local resonators. Oral presentation, ASME IDETC 2018, Quebec City, Canada, August 2018.

Xia, Y., Erturk, A., Ruzzene, M. Selective wave filtering in time-modulated elastic metamaterials. Oral presentation, ASME IDETC 2018, Quebec City, Canada, August 2018.

Xia, Y., Erturk, A., Ruzzene, M. Nonlinear bistable and time-modulated metastructures for wideband wave filtering. Poster presentation, Multifunction Materials and Structures, Gordon Research Conference, Ventura, CA, January 2018.

Xia, Y., Ruzzene, M., Erturk, A. Broadband attenuation introduced by bistable local resonators. Oral presentation, ASME IDETC 2017, Cleveland, OH, August 2017.

Peer Reviews

Journal of Sound and Vibration

Journal of Vibration and Acoustics

Journal of Intelligent Material Systems and Structures