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Engineering & Scientific Consulting

Lauren Katch, Ph.D.

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Professional Profile

Dr. Katch specializes in the mechanics of materials, with expertise in nondestructive ultrasound evaluation and wave propagation. She has experience in materials characterization, 3D printing techniques, and finite element analysis (FEA) across various industries, including electronics, additive manufacturing, defense, and dairy. Her interdisciplinary background in physics, mechanical engineering, and materials science supports her advanced capabilities in materials characterization and quality control across diverse applications.

Dr. Katch earned her PhD in Engineering Science and Mechanics from the Pennsylvania State University. Her dissertation focused on ultrasonic wave propagation in anisotropic silicon wafers for defect detection. She optimized the experimental detection of back-surface breaking cracks through numerical and analytical modeling. To further improve the inspection setup, Dr. Katch designed and 3D printed custom probe lenses, which enabled higher resolution scanning and greater defect sensitivity. This skillset led to her role as an ultrasound expert within a multi-institutional team studying liquid melt pool solidification in laser-based additive manufacturing. She contributed to experimental design, prototyping, and testing at a synchrotron facility, coupling ultrasound and x-ray techniques. Dr. Katch has also applied her expertise to various other domains. These projects include defect detection in phononic crystals, analysis of engineering design heuristics' impact on part inspectability, and ultrasonic inspection of milk coagulation.

Academic Credentials & Professional Honors

Ph.D., Engineering Science and Mechanics, Pennsylvania State University (Penn State), 2024

American Society for Nondestructive Testing Fellowship 2023

Academic Appointments

Graduate Research Assistant, Argüelles Research Group, Pennsylvania State University 2020 – 2024

Graduate Lecturer, Department of Engineering Science and Mechanics, Pennsylvania State University 2024

Graduate Teaching Assistant, Department of Engineering Science and Mechanics, Pennsylvania State University 2023

Prior Experience

Failure Analysis Intern, Intel 2023

Summer Graduate Researcher, Air Force Research Laboratory, 2022

Undergraduate Researcher, Sandia National Laboratories, 2019 – 2020

Lockout Tagout Safety Intern, Rockwell Automation, 2019

Mechanical Design Intern, TAIT 2018

Professional Affiliations

Acoustical Society of America 2021 - Present

American Society for Nondestructive Testing 2021 - Present

American Society of Mechanical Engineers 2021 - Present

Publications

Mutswatiwa, L., Katch, L., Kizer, N. J., Todd, J. A., Sun, T., Clark, S. J., ... & Kube, C. M. (2024). High-speed synchrotron X-ray imaging of melt pool dynamics during ultrasonic melt processing of Al6061. *Communications Materials*, 5(1), 143.

Katch, L., Moghaddaszadeh, M., Willey, C. L., Juhl, A. T., Nouh, M., & Argüelles, A. P. (2023). Analysis of geometric defects in square locally resonant phononic crystals: A comparative study of modeling approaches. *The Journal of the Acoustical Society of America*, 154(5), 3052-3061.

Katch, L., Yeoh, W., Touzanov, O., Pacheco, M., Lan, B., & Argüelles, A. P. (2023). Shear wave ultrasound inspection of flaws in silicon wafers using focused transducers. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*.

Katch, L., & Argüelles, A. P. (2022). Focal depth localization for highly focused transducers in isotropic materials. *The Journal of the Acoustical Society of America*, 152(4), 2405-2411.

Mahan, T., Katch, L., Argüelles, A. P., & Menold, J. (2022). Design for inspectability: a framework to increase inspectability of additive manufacturing parts for pulse-echo ultrasonic inspection methods. *Journal of Mechanical Design*, 144(7), 072001.

Presentations

L. Katch, A.P. Argüelles, Custom Lens Design for Ultrasonic Inspection of Immersed Anisotropic Parts, Acoustical Society of America, May 2024; Ottawa, Canada.

L. Katch, N. Kizer, L. Mutswatiwa, T. Sun, S. Clark, J. Lum, D. Stobbe, and C.M. Kube, Quantitative 3D Melt Pool Characterization using Focused Ultrasound, International Conference on Advanced Manufacturing; October 2023; Washington, DC.

L. Katch, W. Yeoh, B. Lan, and A.P. Argüelles, Anisotropic Crack Scattering in Silicon Wafers Inspected with High Frequency Immersion Ultrasound, International Congress on Ultrasonics; September 2023; Virtual.

L. Katch, W. Yeoh, B. Lan, and A.P. Argüelles, Blind Defect Inspection of Silicon using High Frequency Shear Ultrasound, American Society for Nondestructive Testing Research Symposium; June 2023; Columbus, OH.

L. Katch, M. Moghaddaszadeh, C. Willey, A. Juhl, M. Nouh, and A.P. Argüelles, Defect Inspection in

Phononic Crystals Using Semi-Analytical Approaches., American Society for Nondestructive Testing Research Symposium; June 2023; Columbus, OH

L. Katch, A.P. Argüelles, A Ray Tracing Approach to Focusing Ultrasonic Beams in Isotropic and Anisotropic Solids, Acoustical Society of America Conference; December 2022; Nashville, Tennessee.

L. Katch, A.P. Argüelles, Highly Focused Ultrasonic Beams in Anisotropic Materials, European Solid Mechanics Conference; July 2022; Galway, Ireland.

L. Katch, A.P. Argüelles, High Frequency Ultrasonic Scattering from Cracks in Orthotropic Silicon Wafers, Acoustical Society of America Conference; December 2022; Seattle, WA.

L. Katch, A.P. Argüelles, Vertical Crack Detection in Submillimeter Silicon Wafers, American Society for Nondestructive Testing Conference; April 2021; Virtual.

Peer Reviews

Ultrasonics

Manufacturing Science and Engineering Conference

Additive Manufacturing