Exponent®
Engineering & Scientific Consulting

Lauren Katch, Ph.D.

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Professional Profile

Dr. Katch specializes in mechanical failure analysis and reliability assessment across diverse industries including manufacturing, transportation, consumer products, industrial equipment, and medical devices. Her interdisciplinary expertise spans mechanical engineering and materials science. Dr. Katch's education and professional experiences support her advanced capabilities to provide in-depth technical insights to clients.

Additive Manufacturing and NDT Techniques

Dr. Katch delivers specialized expertise in nondestructive testing (NDT) with emphasis on additive manufacturing applications. Dr. Katch develops custom inspection solutions using experimental techniques combined with finite element modeling to optimize NDT for challenging materials and in-situ applications. Her specialty lies in ultrasonic testing (UT) and characterizing process-structure property relationships in additive manufacturing. Dr. Katch's experience extends to silicon wafer inspection, battery evaluation, and food product testing. This multidisciplinary expertise enables her to provide innovative inspection strategies that enhance product reliability and manufacturing efficiency.

Intellectual Property

Dr. Katch applies her mechanical engineering expertise to intellectual property matters. She provides technical analysis for patent infringement and validity cases as well as trade dress cases. Dr. Katch's engineering perspective helps clients to understand complex technical considerations underlying their IP challenges.

Industrial and Manufacturing Equipment and Workplace Safety

Dr. Katch investigates mechanical equipment and manufacturing processes for both incident analyses and performance evaluation. She evaluates machine safeguarding, lockout/tagout, and regulatory compliance. Her assessment experience includes manufacturing equipment, scaffolding equipment, building maintenance units, and transportation equipment including railcars.

For manufacturing processes, Dr. Katch analyzes production efficiency and resolves technical disputes across various industries. She has specific experience in food manufacturing systems, where she has evaluated mechanical components, assembly sequences, and automation systems. Through detailed mechanical analysis, site inspections, and application of industry standards, she helps clients understand technical aspects of production challenges, mechanical integrity, operational parameters, and compliance requirements.

Consumer Products

Dr. Katch analyzes consumer products throughout their lifecycle, from design validation through end-user experience. She conducts root cause analyses, standard and custom mechanical testing, and computational modeling to evaluate performance. Her experience includes household appliances, personal care appliances, and consumer electronics. Dr. Katch applies mechanical engineering principles to deliver insights on design improvements, reliability, and regulatory compliance.

Prior to joining Exponent, 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 also applied her expertise to various research projects including 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

Katch, L., & Argüelles, A. P. (2025). Acoustic Holograms for Beam Focusing in Immersed Anisotropic Silicon. Journal of Applied Physics, 137(2).

Katch, L., & Argüelles, A. P. (2025). Analysis of Ultrasonic Focusing in Silicon Wafers using the Angular Spectrum Approach and Ray Tracing. Materials Evaluation, 83(1), 50-59.

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., Arguelles, 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