



# Mathematical Methods in Elasticity Imaging (Princeton Series in Applied Mathematics)

*Habib Ammari, Elie Bretin, Josselin Garnier, Hyeonbae Kang, Hyundae Lee, Abdul Wahab*

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This book is the first to comprehensively explore elasticity imaging and examines recent, important developments in asymptotic imaging, modeling, and analysis of deterministic and stochastic elastic wave propagation phenomena. It derives the best possible functional images for small inclusions and cracks within the context of stability and resolution, and introduces a topological derivative–based imaging framework for detecting elastic inclusions in the time-harmonic regime. For imaging extended elastic inclusions, accurate optimal control methodologies are designed and the effects of uncertainties of the geometric or physical parameters on stability and resolution properties are evaluated. In particular, the book shows how localized damage to a mechanical structure affects its dynamic characteristics, and how measured eigenparameters are linked to elastic inclusion or crack location, orientation, and size. Demonstrating a novel method for identifying, locating, and estimating inclusions and cracks in elastic structures, the book opens possibilities for a mathematical and numerical framework for elasticity imaging of nanoparticles and cellular structures.

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