

Rigorous justification for macroscopic waves in a two-dimensional lattice with random masses

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Abstract

The talk will discuss an almost sure approximation of solutions for the lattice differential equation

$$m\ddot{u} = \Delta u \tag{1}$$

by an effective wave equation. Here, m (the masses) are i.i.d. random variables that are contained in some positive interval, and Δ is a discrete Laplace operator. In particular, the talk will present the most important arguments in achieving a rigorous proof for the approximation in the case of a two-dimensional square lattice. The argument hinges upon classical results regarding sub-Gaussian random variables. The two-dimensional case will be contrasted with the one-dimensional case, and the role of dimensionality in the approximation will be discussed.