POLITECNICO DI TORINO

DISMA Dipartimento di Scienze Matematiche G. L. Lagrange

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Online seminar

Monday May 24, 2021 at 16:30
Hosted on: Zoom

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Homogenization in a Random Lattice

Prof. Morandotti introduces the seminar.

Abstract

The behavior of many heterogeneous media, such as porous or composite materials, is described by partial differential equations with coefficients that randomly vary on a small scale. At the macroscopic scale (large compared to the dimension of the heterogeneities) such media often show an effective behavior, which is typically deterministic and emerges as the averaging of the stochastic structure at the microscopic small-scale. The effect of this averaging process, called homogenization, is the independence, of the coefficients of the effective macroscopic model, of the spatial variable. In a pioneering work, Kozlov, Papanicolaou, and Varadhan studied (steady) heat conduction in a randomly inhomogeneous conducting medium and obtained a qualitative homogenization result for stationary, ergodic conductivities. The aim of this talk is to describe the asymptotic behavior of an elliptic operator in a lattice depending on a sequence of independent random variables. We will use a two-scale expansion combined with a spectral gap inequality to predict the rate of convergence towards the limit homogenized operator. Moreover, we show the corresponding quantitative central limit theorem to the random walk evolving in a random lattice.

Biography

Anderson Melchor Hernandez is currently a PhD student at Università di Pavia. He obtained his Bachelor degree at the National University of Colombia, where he studied singular-value problems for tensors. He then obtained his master degree at Università di Perugia, working on stochastic equations.
Anderson's research now focuses on stochastic homogenization problems and quantistic probability. In particular, during his PhD he has worked on functional inequalities to tackle problems concerning stochastically perturbed media. In the framework of quantistic probability, he worked on invariance problems for open random walks and related large deviations.