Homogenization of a Multivariate Diffusion with Semipermeable Reflecting Interfaces

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Seminarraum SE41 • Forschungsbau (Emil-Fischer-Straße 41, 97074 Würzburg)
Der Vortrag wird auch Zoom-Meeting übertragen: go.uniwue.de/ifmcolloquium-zoom

Abstract. The mathematical problem of homogenization typically involves studying the effective parameters of a system that exhibits rapid variations in its spatial characteristics. However, we focus on a stochastic multivariate homogenization problem of a different kind: the diffusion in the presence of narrowly located semipermeable interfaces.

In simple words, our model reminds of a foiled composite material consisting of a media interlaced with very thin plates of different permeability. In material science such models are referred to as reinforced materials like a glass wool reinforced by aluminium foil. Usually, one is interested in the effective parameters of such a system. By combining the study of stochastic differential equations with local times and homogenization, we explore how the presence of interfaces can alter the diffusion behavior of the limit process.

As a byproduct of our research, we obtain theorems for the existence and uniqueness of solutions to SDEs for multidimensional diffusion processes with membranes. Uniqueness is a problem of particular interest because it implies the strong Markov property of the solution, which is essential for the proof of convergence.