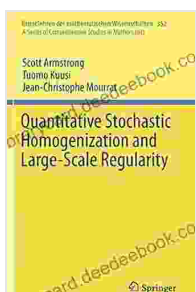# Quantitative Stochastic Homogenization And Large Scale Regularity Grundlehren

Stochastic homogenization is a powerful tool for studying the effective behavior of random media. It provides a systematic way to derive effective equations that describe the macroscopic behavior of a system from its microscopic constituents. In recent years, there has been growing interest in quantitative stochastic homogenization, which aims to provide sharp estimates for the effective coefficients. This article provides an overview of some recent developments in quantitative stochastic homogenization, with a focus on large-scale regularity.

The goal of quantitative stochastic homogenization is to obtain sharp estimates for the effective coefficients of a random medium. This is in contrast to classical stochastic homogenization, which only provides qualitative results, such as the existence of an effective equation.

There are a number of different techniques that can be used to obtain quantitative estimates. One common approach is to use corrector estimates. This involves constructing a corrector field that corrects the local behavior of the solution to the effective equation. The corrector field can then be used to derive sharp estimates for the effective coefficients.

Quantitative Stochastic Homogenization and Large-Scale Regularity (Grundlehren der mathematischen Wissenschaften Book 352) by Derek Slaton

★★★★☆ 4.4 out of 5

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Another approach to quantitative stochastic homogenization is to use probabilistic methods. This involves using probabilistic tools, such as concentration inequalities, to obtain sharp estimates for the effective coefficients.

Large-scale regularity is a property of random media that ensures that the effective coefficients are smooth on a large scale. This is in contrast to small-scale regularity, which only ensures that the effective coefficients are smooth on a small scale.

There are a number of different conditions that can be used to ensure large-scale regularity. One common condition is the condition of strong local ergodicity. This condition ensures that the local behavior of the random medium is ergodic, which in turn implies that the effective coefficients are smooth on a large scale.

Another condition that can be used to ensure large-scale regularity is the condition of spatial mixing. This condition ensures that the random medium is well-mixed on a large scale, which in turn implies that the effective coefficients are smooth on a large scale.

Quantitative stochastic homogenization has a wide range of applications in science and engineering. Some of the most common applications include:

- **Effective conductivity of composite materials:** Quantitative stochastic homogenization can be used to derive effective equations for the conductivity of composite materials. These equations can be used to predict the macroscopic behavior of the composite material from its microscopic constituents.

- **Effective permeability of porous media:** Quantitative stochastic homogenization can be used to derive effective equations for the permeability of porous media. These equations can be used to predict the macroscopic behavior of the porous medium from its microscopic constituents.

- **Effective elasticity of random media:** Quantitative stochastic homogenization can be used to derive effective equations for the elasticity of random media. These equations can be used to predict the macroscopic behavior of the random medium from its microscopic constituents.

Quantitative stochastic homogenization is a powerful tool for studying the effective behavior of random media. It provides a systematic way to derive effective equations that describe the macroscopic behavior of a system from its microscopic constituents. In recent years, there has been growing interest in quantitative stochastic homogenization, with a focus on large-scale regularity. This article has provided an overview of some recent developments in quantitative stochastic homogenization, with a focus on large-scale regularity.

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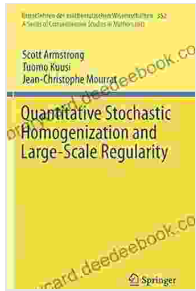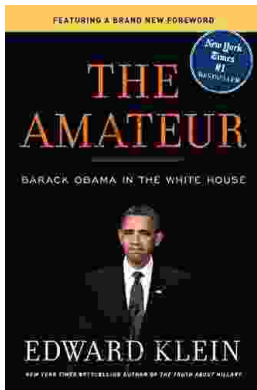
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