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PREFACE

The mathematical study of "multiscale problems" has grown remarkably since the seventies beyond the asymptotic analysis of PDE's governing the behavior of heterogeneous media. The search for sharp bounds on the effective moduli of composites and homogenization approximation errors has led investigators to derive as much information as possible about fields in composites, and the behavior of correctors in periodic and stochastic environments.

Practical applications (such as reservoir modeling and wave propagation in ground structures) have motivated the development of new methods for the multiscale simulation of PDEs. One of such methods, numerical homogenization, has its roots in classical homogenization but aims at the low/finite dimensional approximation of solution spaces of PDEs with rough coefficients without the classical assumptions of scale separation and periodicity/ergodicity. Other methods are based on approximate matrix factorizations based on the low rank approximation of Green's functions.

This special volume of M2AN focuses on new research contributions representing the state of the art, perspectives and evolution of the mathematical modeling and (possibly numerical) analysis of such problems.

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Guest Editors

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