

Effective Approximation based on Boundary Measurements

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Inverse Multiscale Problem

An Inverse Multiscale Problem

• Consider the problem

 $\begin{cases} -\operatorname{div} \left(A_{\varepsilon} \nabla u \right) = 0 & \text{in } \Omega, \\ \left(A_{\varepsilon} \nabla u \right) \cdot n = g & \text{on } \partial \Omega \end{cases}$

oscillating at the (not infinitely) small length scale ε .

• A_{ε} is assumed to be unknown.



• Only boundary (possibly aggregated) information are available.

Objective

Construct a <u>constant</u> diffusion coefficient \overline{A}^{opt} , such that the solutions $u(\overline{A}^{opt}, g)$ to the associated coarse diffusion problem are <u>satisfying</u> approximations of the solutions $u(A_{\varepsilon}, g)$ to the oscillating problem.

Strategy: Homogenization, Optimization