

عنوان مقاله:

Nonlinear Multiscale Modelling and Design using Gaussian Processes

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خلاصه مقاله:

A method for nonlinear material modeling and design using statistical learning is proposed to assist in the mechanical analysis of structural materials. Conventional computational homogenization schemes are proven to underperform in analyzing the complex nonlinear behavior of such microstructures with finite deformations. Also, the higher computational cost of the existing homogenization schemes inspires the inception of a data-driven multiscale computational homogenization scheme. In this paper, a statistical nonlinear homogenization scheme is discussed to mitigate these issues using the Gaussian Process Regression technique. A data-driven model is trained for different strain states of microscale unit cells. In the macroscale, nonlinear response of the macroscopic structure is analyzed, for which the stresses and material responses are predicted by the trained surrogate model.

کلمات کلیدی:

Gaussian processes, multiscale modelling, material modelling, statistical learning, data-driven continuum mechanics

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