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Physics Informed Neural Networks for an Inverse Problem in Peridynamic Models

Difonzo Fabio V.[1], **Lopez Luciano**[2] **and Pellegrino Sabrina F.**[3]

[1]Istituto per le Applicazioni del Calcolo "Mauro Picone" - Consiglio Nazionale delle Ricerche
[2]Università degli Studi di Bari Aldo Moro
[3]Politecnico di Bari

Deep learning is a powerful tool for solving data driven differential problems and has come out to have successful applications in solving direct and inverse problems described by PDEs, even in presence of integral terms. In this paper, we propose to apply radial basis functions (RBFs) as activation functions in suitably designed Physics Informed Neural Networks (PINNs) to solve the inverse problem of computing the peridynamic kernel in the nonlocal formulation of classical wave equation, resulting in what we call RBF-iPINN. We show that the selection of an RBF is necessary to achieve meaningful solutions, that agree with the physical expectations carried by the data. We support our results with numerical examples and experiments, comparing the solution obtained with the proposed RBF-iPINN to the exact solutions.