Artificial neural networks to solve the singular model with Neumann–Robin, Dirichlet and Neumann boundary conditions

ABSTRACT

The aim of this work is to solve the case study singular model involving the Neumann–Robin, Dirichlet, and Neumann boundary conditions using a novel computing framework that is based on the artificial neural network (ANN), global search genetic algorithm (GA), and local search sequential quadratic programming method (SQPM), i.e., ANN-GA-SQPM. The inspiration to present this numerical framework comes through the objective of introducing a reliable structure that associates the operative ANNs features using the optimization procedures of soft computing to deal with such stimulating systems. Four different problems that are based on the singular equations involving Neumann–Robin, Dirichlet, and Neumann boundary conditions have been occupied to scrutinize the robustness, stability, and proficiency of the designed ANN-GA-SQPM. The proposed results through ANN-GA-SQPM have been compared with the exact results to check the efficiency of the scheme through the statistical performances for taking fifty independent trials. Moreover, the study of the neuron analysis based on three and 15 neurons is also performed to check the authenticity of the proposed ANN-GA-SQPM.