Computational and artificial neural network study of MHD ternary nanofluid flow with chemical reaction and heat source/sink

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Abstract

Ternary nanofluids have been an interesting field for academics and researchers in the modern technological era because of their thermophysical properties and the desire to increase heat transfer rate. The present article encapsulates the outcomes of research on heat and mass transport over non-Newtonian ternary Casson fluid on a radially extending surface under a transverse magnetic field with convective boundary conditions. The model equations were reduced from partial to ordinary differential equations through applying appropriate similarity transformations. The shooting technique and the byp-4c algorithm were then used to analyze the numerical data. The obtained numerical results are then displayed graphically. The present study reveals that improvement in Casson parameter diminishes the axial velocity but an improvement is seen in thermal distribution for rising behavior of heat source/sink and Biot number parameter, and the concentration profile will deteriorate when the mass transfer is elevated. Furthermore, the resulting values of the Skin-friction, Nusselt number, and Sherwood number coefficients are numerically analyzed and tabulated. Furthermore, the numerical solutions of the ternary nanofluid model of heat/mass transport were carried out utilizing the Artificial neural network (ANN) together with the Levenberg-Marquardt backpropagation technique. To accurately represent complex patterns, neural networks modify their parameters flexibly, resulting in more accurate predictions and greater generalization with numerical outcomes.