Implementation of Artificial Neural Network using Levenberg Marquardt Algorithm for Casson-Carreau Nanofluid Flow over Exponentially Stretching Curved Surface

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Abstract: Levenberg-Marquardt technique is used to train a machine learning language made of artificial neural networks to train the mathematical model constructed by Casson-Carreau nanofluid flow over a curved surface that is stretched exponentially, including chemical reaction, and an exponential heat source component. The activation energy effect is taken into account while analyzing the impactof fluid concentration. At boundary, double stratification and Stefan blowing boundary conditions are used. Runge-Kutta Fehlberg numerical approach is applied to form the solution. Artificial neural networks are used to train, test, and validate numerical computations, and linear regression models, histograms, and mean squared errors are used to verify the model's accuracy. The Levenberg-Marquardt scheme is used for training, using 15% data for testing, 15% - validation, and 70% for training. To get a good estimation, the neural network trained for the modeled problem records the performance, training state, and regression. This forecasts the trained model's accuracy. Also, the least amount of inaccuracy is shown in the histogram that was captured for each of the six instances. The accuracy of the training is predicted by the error in the range of $10^{-3}-10^{-4}$ according to the absolute error analysis for the six parameters under consideration.

Keywords: Artificial neural network; Casson-Carreau nanofluid; Exponential stretching sheet; Activation energy;